

PATENT APPLICATION
Atty Docket: 678-1193 (P11061)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): KIM, Jae-Shik

Examiner: JACKSON, Andre L.

SERIAL NO.: 10/808,779

Group Art Unit: 3677

FILED: March 25, 2004

FOR: ROTARY TYPE HINGE DEVICE FOR
PORTABLE WIRELESS TERMINAL

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

37 C.F.R. § 1.131 DECLARATION OF PRIOR INVENTION
MADE IN THE REPUBLIC OF KOREA
TO OVERCOME CITED PATENT PUBLICATION

BEST AVAILABLE COPY

Sir:

I, Jae-Shik KIM, hereby declare that:

1. I am an inventor for the above-referenced patent application, which claims priority to application number 2003-22098 that was filed with the Korean Industrial Property Office on April 8, 2003.
2. This declaration is submitted to establish reduction to practice of the invention of the above-referenced patent application in the Republic of Korea prior to March 3, 2003, which is the effective filing date of U.S. Patent Application Serial No. 10/506,865, naming Jung et al. as inventors, and assigned Publication No. US 2005/0198779 A1, and which was cited by the Examiner in the above-referenced patent application.

3. This declaration is submitted prior to issuance of a final rejection in the above-referenced patent application.
4. To establish the date of reduction to practice of the invention of the above-referenced patent application, the following documents are attached hereto and are submitted as evidence:
 - a. Exhibit A is an invention disclosure document;
 - b. Exhibit B is a certified translation of Exhibit A; and
 - c. Exhibit C is a certified translation of application number 2003-22098 that was filed with the Korean Industrial Property Office on April 8, 2003.
5. The invention disclosure document provided as Exhibit A hereto was completed at least before March 3, 2003, which is earlier than the effective filing date of *Jung et al.*
6. The invention disclosure document and the translation thereof, provided as Exhibits A and B, respectively, to this Declaration show a reduction to practice of the invention claimed in the above-referenced patent application.

PATENT APPLICATION
Atty Docket: 678-1193 (P11061)

7. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statement may jeopardize the validity of the application or any patent issuing thereon.

Date: Jan 25, 2026

Jae Shik Kim
Jae-Shik KIM

Country of Citizenship: Republic of Korea

Residence Post Office Address: 19, Chunghwa 1-dong, Chungnang-gu,
Seoul, Republic of KOREA

◇ 사건/파일 조회

사건 <i>Case</i>	직발접수) 일반	일자 <i>Date</i>	2002/12/09
발신일	-	수신일	-
제목	직무발명서 (<u>Invention Disclosure</u>)		
의견	-		

파일명	파일설명
한지 구조.gul	한지 하우스징 구조

Hinge Structure

닫기

직무발명(고안)명세서 (Invention Disclosure)				【사전체크 사항】		
● 발명의 명칭 (Title of Invention) ※ 발명(고안)의 내용을 표현할 수 있는 명칭을 간단 명료하게 기재				○선출원주의이므로 신속출원이 필요함 ○완성된 발명이여야 함 - 실시예, Data등의 뒷받침이 필요 ○미완성 또는 화방사항 불가 ○출원전에 공표 금지 - 학회, 논문, 판매, 전시 금지		
국 문	무선단말기의 힌지 구조					
영 문						
● 관련 선행 기술 및 선출원				- 본 발명과 관련이 있는 기술이 이미 출원되어 있거나 현재 진행중인 것을 모두 기재함. - 국내우선권 주장이 목적이며, 최초 출원일로 부터 1년이내에는 개량출원이 가능함.		
[기술출처] (해당 부분만 선택 기재)	유사 특허 또는 출원	출원/등록번호		출원/등록일자		
		발명의 명칭				
		출 원 인				
	배경 문헌 또는 제품	문헌명/제품모델명		발표자/제조사		
		발표/제조 년월일		페이지/기타		
	발명(고안)과 관련된 발명자의 선출원	既 출원 건	발명의 명칭			
			출원번호/일자		(19 . . .)	
		진행중인 건	발명의 명칭			
접수번호/일자			(19 . . .)			

1. 발명의 배경

가. 본 발명의 기술분야

나. 종래기술의 설명

다. 종래기술 문제점 및 본 발명의 목적

- 본 발명의 목적

2. 발명(고안)의 구체적 설명

가. 발명의 구성

1. 힌지 샤프트
2. 힌지 캠
3. 힌지 하우징
4. 스프링

나. 발명의 동작설명

힌지 샤프트가 회전하면 캠은 샤프트의 회전축과 직각방향으로 수평운동을 하게 된다. 여기서 스프링은 압축되게 되고, 힌지 샤프트가 180도 회전하면 힌지 캠은 스프링 탄성력에 의해 복원되게 하여 샤프트의 회전을 구속 시키게 된다. 위의 방법을 반복하여 180도 마다 힌지의 구속을 유발할수 있다.

다. 발명의 효과

3. 권리 청구의 범위

○ 특허발명과 기술범위를 결정하는 매우 중요한 항목임 (※ 설명부분이 필요없을시 삭제가능)

- 독점권을 얻고싶은 특정사항만을 기술한다.
- 본 발명의 특징과 같은 효과를 얻기위해서 필요한 신규의 구성요소를 기술한다.

【 기재 예 】

1. 상위개념(독립항)

- X X X기능을 하는 A와 Y Y Y기능을 하는 B로 구성된 ○○장치(회로)
- A단계와 B단계와 C단계로 이루어지는 ○○방법

2. 하위개념(종속항)

- 제1항(독립항인용)에 있어서 동신호, 검출부(수단)는 --하는 --와, --하는 --로 구성된 ○○장치(회로)
- 제1항(독립항인용)에 있어서 A단계의 접속이 ○○인 ○○방법

3. 상위개념(독립항)

1. 힌지 샤프트 회전축과 캠의 운동방향이 수직인 힌지 구조
2. 1항에서 캠이 2개이고 힌지 샤프트의 홈은 원점 대칭으로 2개를 두거나 그 이상 이하를 둘수 있다.
(홈2개 일경우 180도 구속, 4개 90도 구속, 6개 60도 구속...)
3. 1항에서 바람직 한적용예는 캠의 개수가 2개 이나 그 이상, 이하로 둘수 있다.
4. 바람직한 적용예로 로테이션 힌지에 적용하는 것인데, 기존과 대비하여 가장 큰 특징은 로테이션 힌지가 폴더 내부에 결합됨을 특징으로 한다..
5. 5항에서 힌지 하우징은 폴더에 결합이 되고 힌지 샤프트가 본체에 결합이 된다.

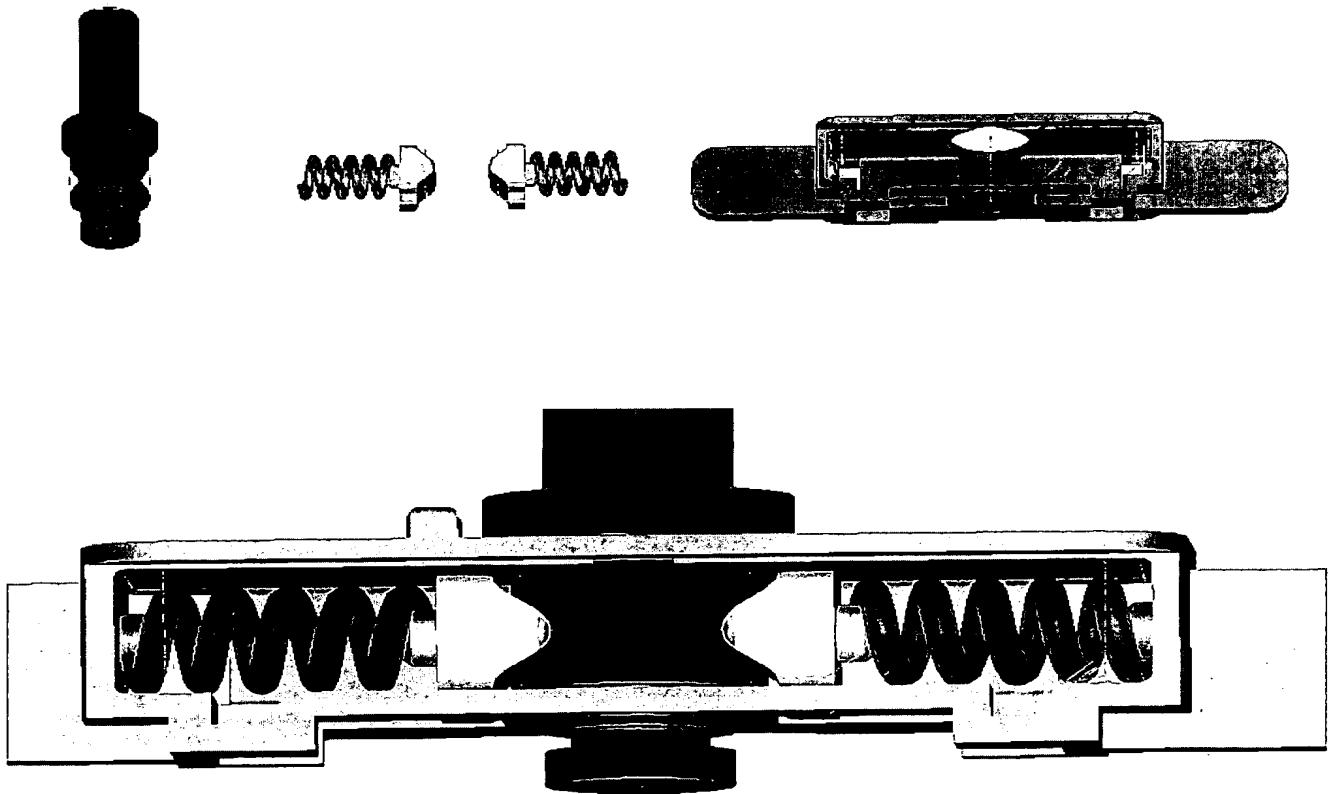
4. 도 면

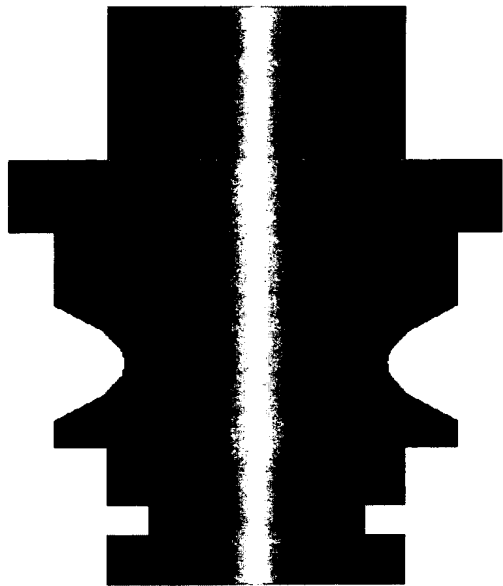
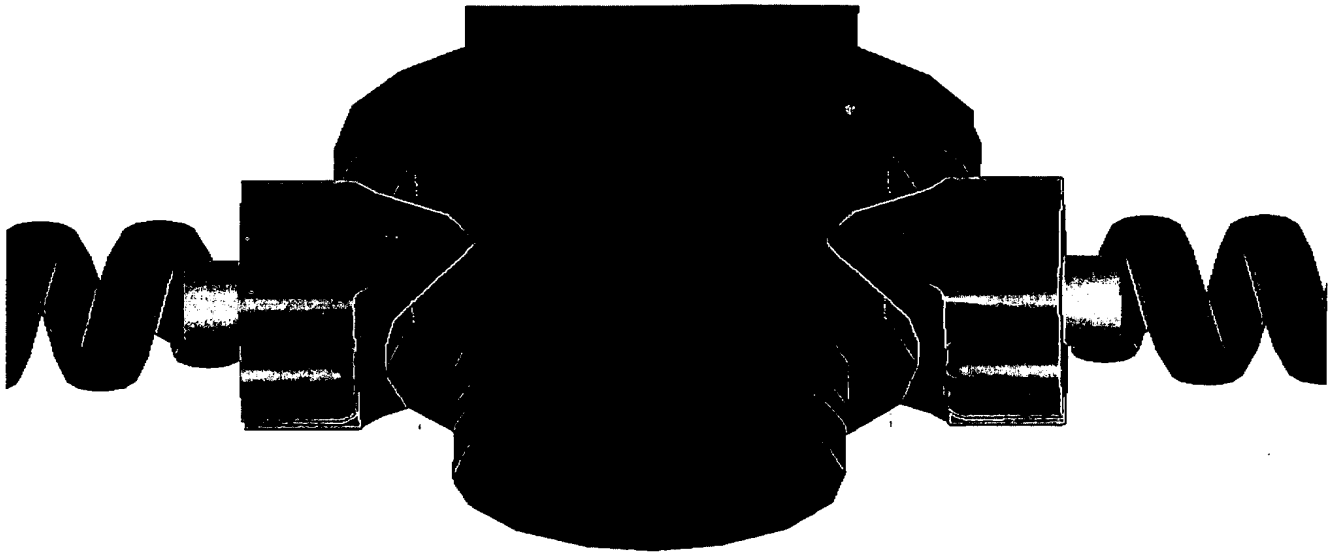
1. 발명의 특징을 가장 잘 나타낼 수 있는 것을 대표도로 하며, 발명의 구체적 설명에서 인용할 부호와 도면 상의 부호를 일치시켜 기입한다.
2. 도면에 대한 간단한 설명을 도면아래 기입한다. (※ 설명부분이 필요없을시 삭제가능)

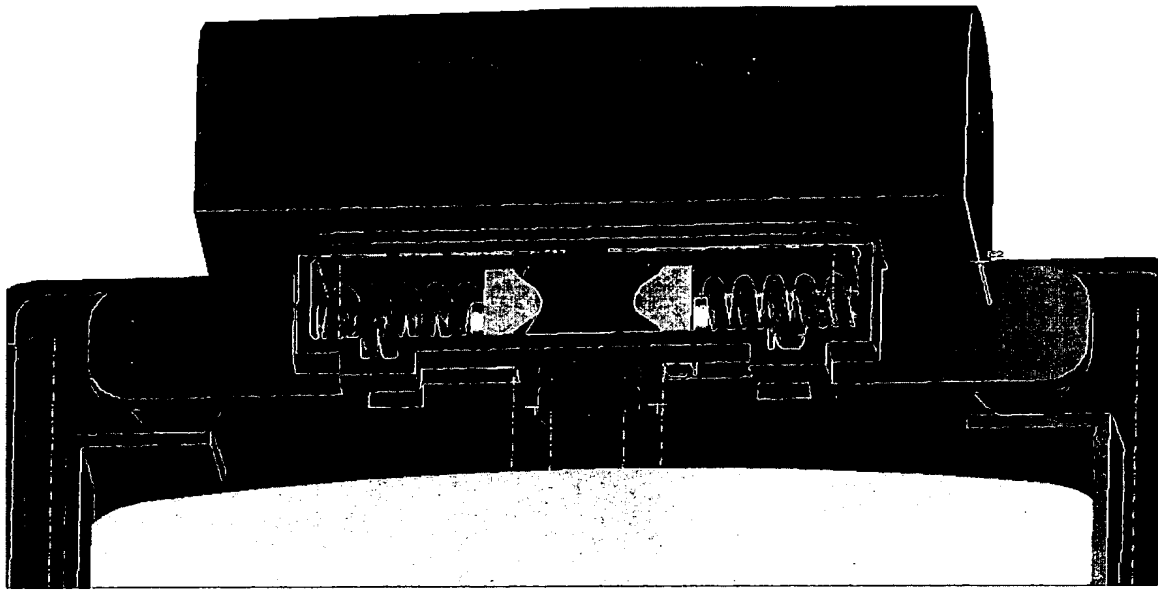
가. 종래기술의 도면

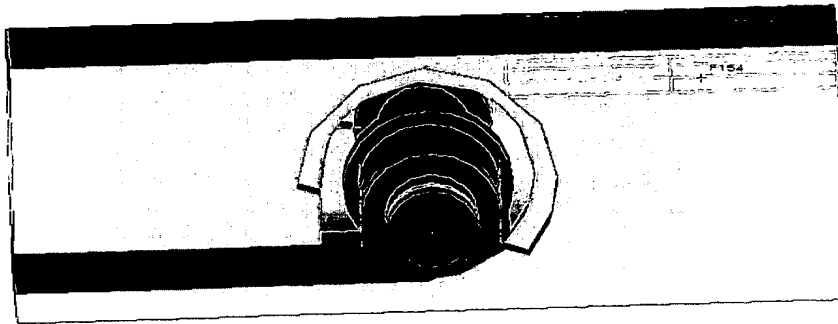
나. 본 발명의 도면

1. 발명의 구성도



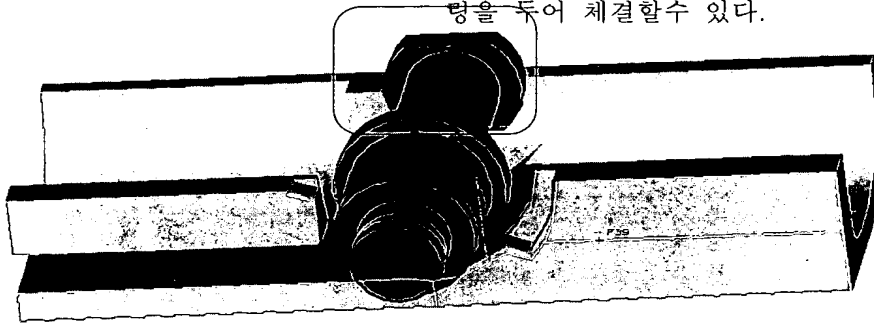




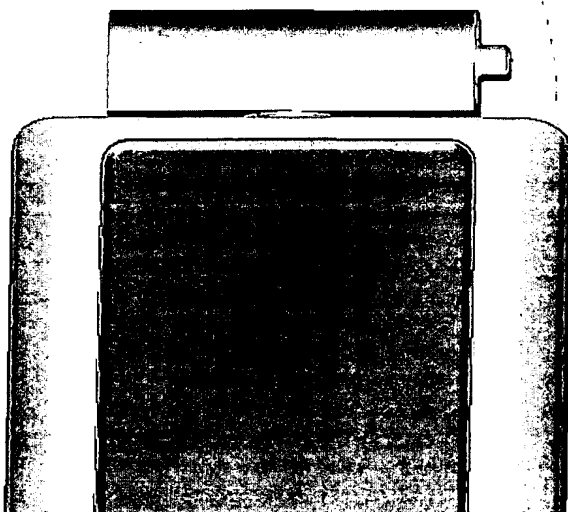


힌지 샤프트가 본체에 결합되어진 모습

샤프트의 끝단에는 회전을 방지할수 있는 각형구조를 두어야 하며 본체와의 결합은 본체에 샤프트에 있는 각형구조의 홈을 두어 강제 압입하는 방식이나 본체의 뒷면에서 나사나 e-링을 두어 체결할수 있다.

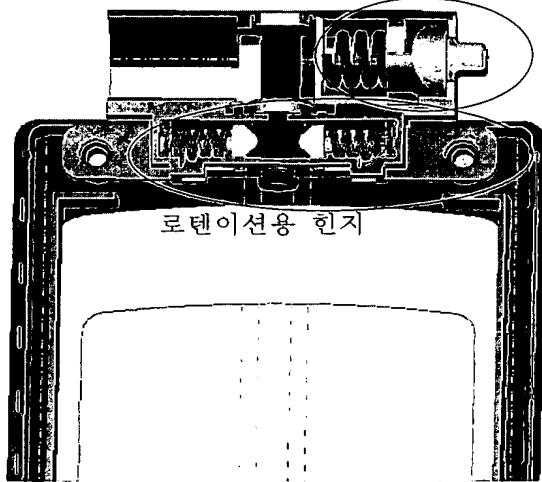


본체의 뒷면을 절개한 모습



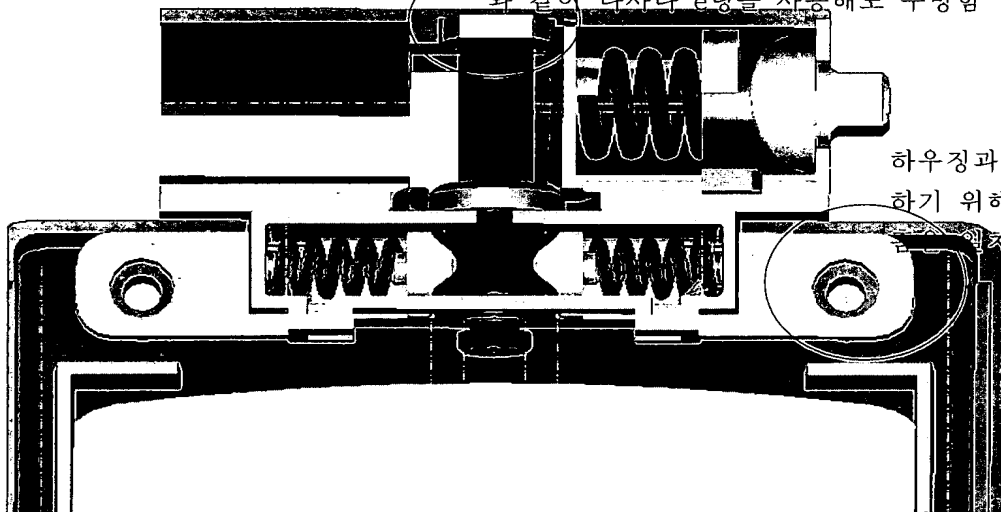
본 발명을 통해 구현 해본 회전 폰의 외형도

폴더를 열때쓰이는 힌지

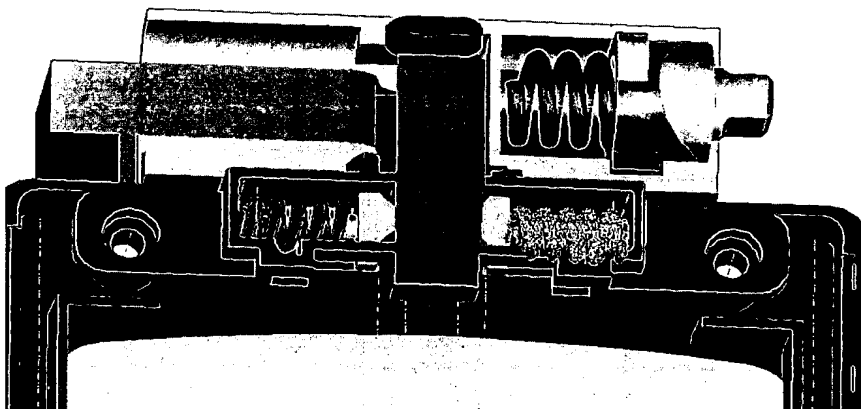


위의 로테이션 폰에서 폴더의 upper를 분해하고 본체의 일부를 절단한 모습

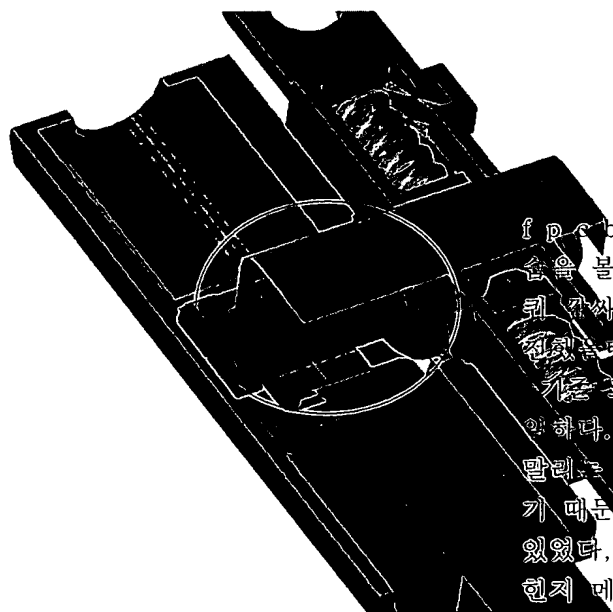
본체와 샤프트는 하나로 고정이 되어야 하기에 본체에 홈을 두어 샤프트를 강제 압입하는 방식을 택하였다. 위에서 설명한바와 같이 나사나 e링을 사용해도 무방함



하우징과 폴더를 일체형으로 유지하기 위해 하우징과 폴더의 나사 위치시켜 고정토록 함



f p c b결합도면 (녹색으로 표시)



위의 그림을 다른 방향에서 본 모습

f p c b가 샤프트의 봉을 반 바퀴 감싸고 있는 모습을 볼 수 있다. 폴더가 180도 회전을 하므로 반바퀴 감싸는 구조를 두었고, 폴더가 시계방향으로 회전했을 때 f p c b는 풀리는 구조가 된다.

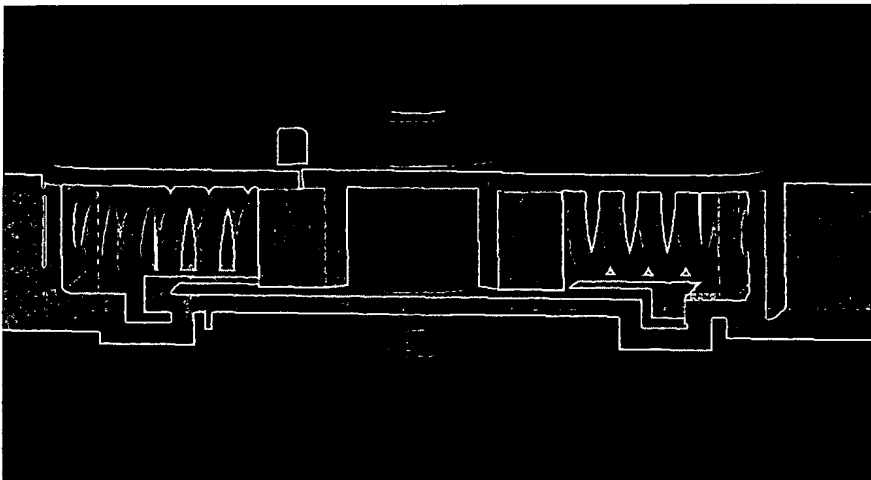
기존 로테이션 폰과 f p c b가 열리는 구조는 동일하다. 하지만 기존에는 샤프트 봉(즉 f p c b가 열리는 위치)에 모든 힌지메카니즘이 집중되어 있기 때문에 힌지의 두께를 얇게 할 수 없다는 단점이 있었다. 하지만 여기서는 f p c b가 열리는 구간에 힌지 메카니즘이 없기에 두께 조정이 가능한 구조라 하겠다.

캠

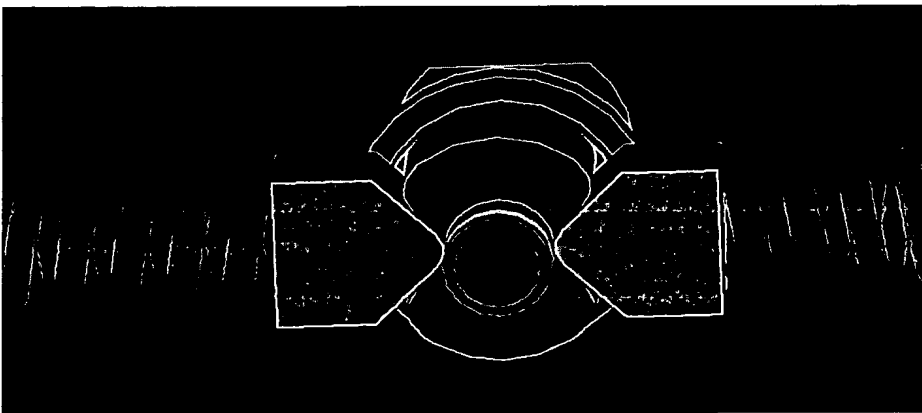
샤프트



샤프트의 회전축과 캠의 운동 방향이 수직인 구조의 직무 발명서에 제시한 방안
-샤프트에 축방향과 수직으로 홈이 있고 캠은 그홈에 끼워지는 구조



추가 적인 구조 제시안
-샤프트의 회전축과 캠의 운동 방향이 수직인 구조는 동일하나 샤프트 홈의 방향을 추가하고자 합니다.



샤프트 홈의 방향을 축과 동일한 방향으로 두어 샤프트가 회전할때 캠이 수직운동을 할수 있는 구조입니다.

CERTIFICATE OF TRANSLATION

As a below named translator, I hereby declare that my residence and citizenship are as stated below next to my name and I hereby certify that I am conversant with both the English and Korean languages and the document enclosed herewith is a true English translation of the Invention Disclosure with respect to the Korean patent application No. **2003-22098** filed on **April 8, 2003**.

NAME OF THE TRANSLATOR : Ji-Hoi KIM

SIGNATURE :

Date : January 27, 2006

A handwritten signature in black ink, appearing to read 'Ji-Hoi Kim', written over a horizontal line.

RESIDENCE : MIHWA BLDG., 110-2, MYONGRYUN-DONG 4-GA,
CHONGRO-GU, SEOUL 110-524, KOREA

CITIZENSHIP : REPUBLIC OF KOREA

HINGE DEVICE FOR WIRELESS TERMINAL

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 2. Description of the Related Art

3. Problem of Prior Art and Object of the Invention

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Structure of the Invention

- 1. Hinge shaft
- 2. Hinge cam
- 3. Hinge housing
- 15 4. Spring

Operation of the Invention

When the hinge shaft rotates, the hinge cam horizontally moves perpendicularly to a rotating axis of the hinge shaft. Thus, the spring is compressed. When the hinge shaft has rotated by an angle of 180°, the hinge cam
20 returns to its original position due to the elastic force of the spring, thereby restricting the rotation of the hinge shaft. In this way, the rotation of the hinge shaft may be restricted whenever it rotates by an angle of 180°.

Effect of the Invention

CLAIMS

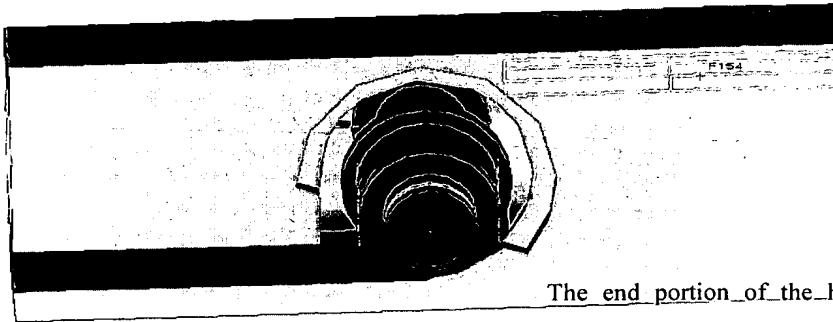
1. A hinge device comprising a hinge shaft and a hinge cam, which moves perpendicularly to a rotating axis of the hinge shaft.

2. The hinge device as claimed claim 1, wherein two hinge cams are provided and two slots are symmetrically formed in the hinge shaft about a starting point of rotation of the hinge shaft, or more than or less than two slots can be formed in the hinge shaft, in which the rotation of the hinge shaft is restricted whenever the hinge shaft rotates by an angle 180° if two slots are formed in the hinge shaft, the rotation of the hinge shaft is restricted whenever the hinge shaft rotates by an angle 90° if four slots are formed in the hinge shaft, and the rotation of the hinge shaft is restricted whenever the hinge shaft rotates by an angle 60° if six slots are formed in the hinge shaft.

3. The hinge device as claimed claim 1, wherein more than or less than two hinge cams can be provided.

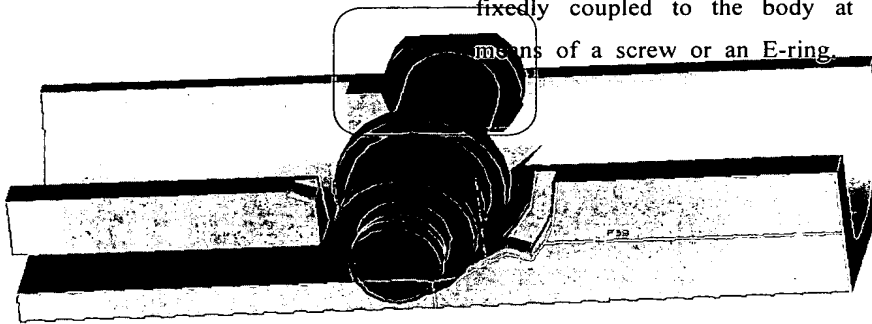
4. The hinge device as claimed claim 1, wherein the hinge device is a rotary hinge device coupled to an inner portion of a folder.

5. The hinge device as claimed claim 1, wherein a hinge housing is coupled to a folder and the hinge shaft is coupled to a body of a mobile terminal.

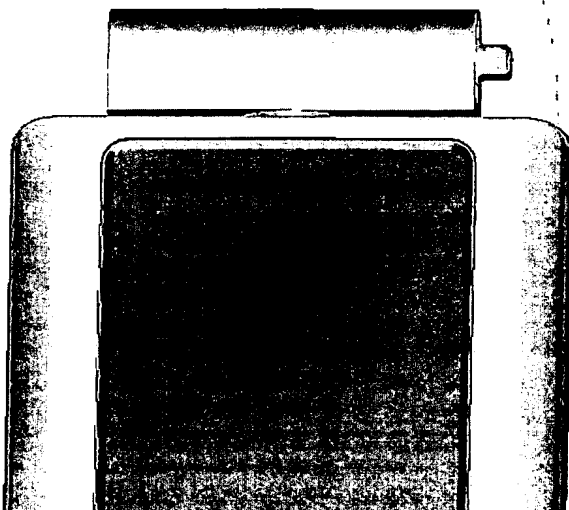


A view showing a hinge shaft coupled to the body.

The end portion of the hinge shaft must be formed with an anti-rotation part. A recess is formed in the body corresponding to the anti-rotation part of the hinge shaft, and the anti-rotation part is press-fitted into the recess of the body, thereby fixedly coupling the hinge shaft to the body. Otherwise, the hinge shaft is fixedly coupled to the body at a rear portion of the body by means of a screw or an E-ring.



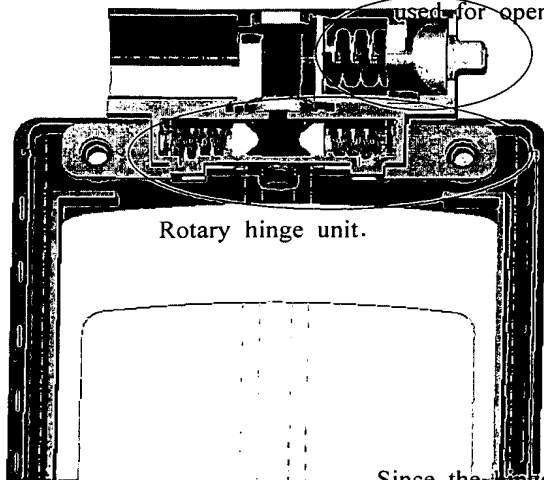
A sectional view showing the hinge shaft coupled to the body.



A view showing an external appearance of a rotary phone according to the present invention.

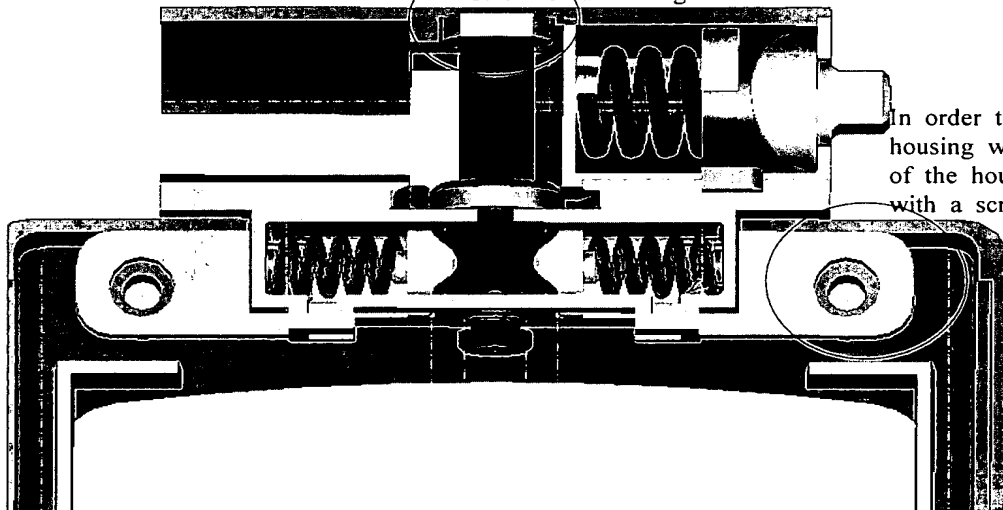
A hinge unit

used for opening a folder.

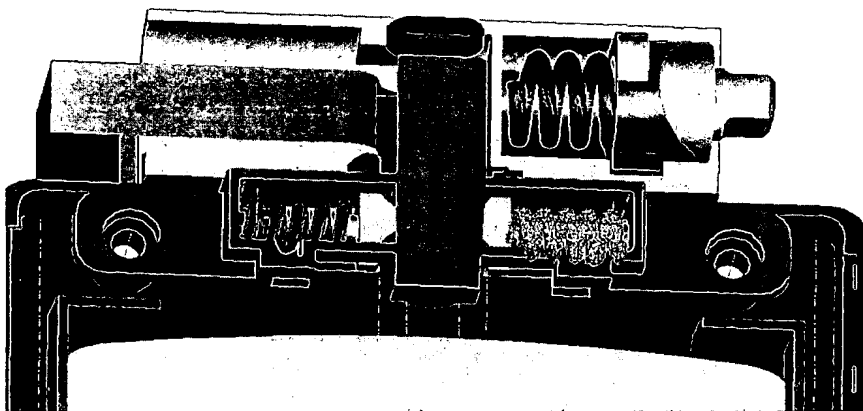


A partially sectional view showing a body of the rotary phone obtained by removing an upper portion of the folder.

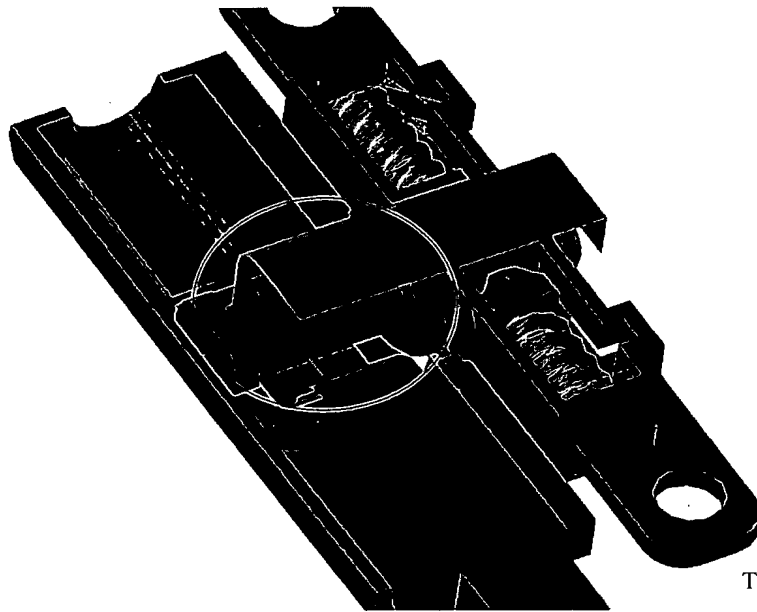
Since the hinge shaft must be securely fixed to the body, the hinge shaft is press-fitted into the recess formed in the body. It is also possible to fixedly couple the hinge shaft to the body by using a screw or an E-ring.



In order to integrally form the housing with the folder, a screw hole of the housing is aligned matching with a screw hole of the folder.



A view showing a flexible PCB (see, green color) coupled to the body.



A view showing a flexible PCB viewed from a direction different from the above direction.

The flexible PCB surrounds a half of the hinge shaft. This is because the folder rotates by an angle of 180° . If the folder rotates clockwise, the flexible PCB is released from the hinge shaft.

This flexible PCB structure is similar to that of the conventional rotary phone. However, according to the conventional phone, the hinge mechanism is concentrated on the predetermined portion of the hinge shaft (that is, the portion surrounded by the flexible PCB), so the thickness of the hinge cannot be reduced. According to the present invention, the hinge mechanism is not located on the predetermined portion of the hinge shaft, which is surrounded by the flexible PCB, so that it is possible to adjust the thickness of the hinge.

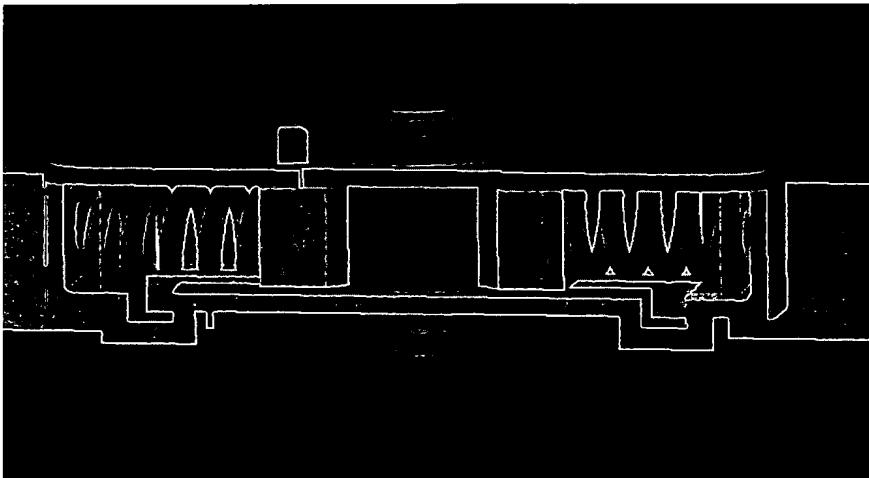
hinge
cam

hinge shaft

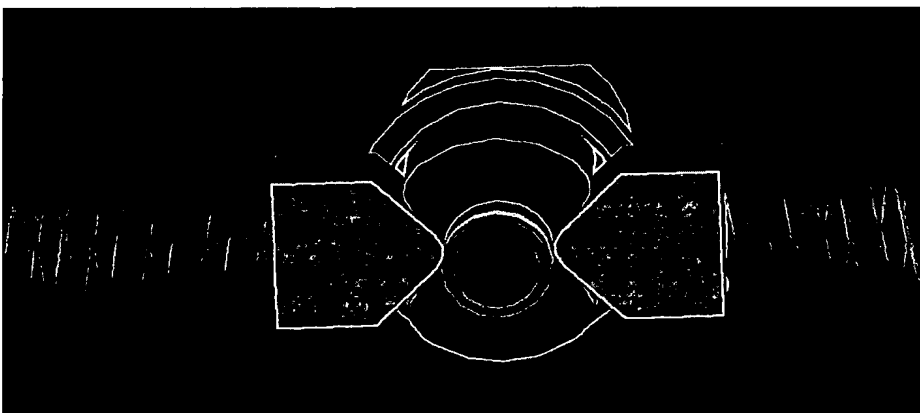


The rotating axis of the hinge shaft is perpendicular to the moving direction of the hinge cam.

- Slots are formed in the hinge shaft perpendicularly to the rotating axis of the hinge shaft and hinge cams are inserted into the slots.



Modified structure- The rotating axis of the hinge shaft is perpendicular to the moving direction of the hinge cam, but the extension direction of the slots is changed.



The slots extend lengthwise along the hinge shaft corresponding to the rotating axis of the hinge shaft, so that the hinge cam moves up and down when the hinge shaft rotates.

CERTIFICATE OF TRANSLATION

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NAME OF THE TRANSLATOR : Ji-Hoi KIM

SIGNATURE : _____



Date : January 27, 2006

RESIDENCE : MIHWA BLDG., 110-2, MYONGRYUN-DONG 4-GA,
CHONGRO-GU, SEOUL 110-524, KOREA

CITIZENSHIP : REPUBLIC OF KOREA

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[ABSTRACT OF THE DISCLOSURE]

[ABSTRACT]

5 Disclosed herein is a rotary type hinge device, which is installed between a terminal body and a folder of the portable wireless terminal. The hinge device has a first rotation axis for opening and closing operations of the terminal body and folder, and a second rotation axis extending perpendicular to the first
10 rotation axis to be rotated relative to the first rotation axis. The hinge device is adapted to rotate the folder about the second rotation axis in a state wherein the folder and terminal body are opened. According to the present invention, the hinge device comprises: a first hinge housing coupled to the terminal body to rotate about the first rotation axis; a main shaft having its one end fixed to the
15 inner peripheral surface of the first hinge housing and the other end thereof protruded outwardly from one side of the first hinge housing; and a second hinge housing rotatably coupled to the other end of the main shaft protruded outwardly from the first hinge housing and adapted to rotate about the second rotation axis. The second hinge housing is fixed to the folder. The rotary type hinge
20 device constructed as stated above enables the biaxial rotation of the folder, thereby allowing the reversal of front and rear surfaces thereof. Therefore, the portable wireless terminal has advantages that the change of the specification or design thereof is easy and its convenience of use is increased.

[SPECIFICATION]

[TITLE OF THE INVENTION]

5

ROTARY TYPE HINGE DEVICE FOR PORTABLE WIRELESS TERMINAL

[BRIEF DESCRIPTION OF THE DRAWINGS]

10 Fig. 1 is an exploded perspective view illustrating a rotary type hinge device for a portable wireless terminal in accordance with a preferred embodiment of the present invention;

15 Fig. 2 is a perspective view illustrating a shaft cam and stopper cam of the rotary type hinge device shown in Fig. 1;

 Fig. 3 is a perspective view illustrating another type of shaft cam and stopper cam of the rotary type hinge device shown in Fig. 1;

20 Fig. 4 is a perspective view illustrating still another type of shaft cam and stopper cam of the rotary type hinge device shown in Fig. 1;

25 Fig. 5 is a partial cut-away perspective view illustrating a state wherein the rotary type hinge device shown in Fig. 1 is coupled to a folder of the portable wireless terminal;

 Fig. 6 is a partial cut-away perspective view illustrating a state wherein a flexible printed circuit is mounted through the rotary type hinge device shown in Fig. 1;

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 Fig. 7 is a perspective view illustrating a state wherein the rotary type hinge device shown in Fig. 1 is coupled to the folder;

35 Fig. 8 is a front view illustrating a portable wireless terminal employed with the rotary type hinge device shown in Fig. 1;

Fig. 9 is a perspective view illustrating a reversal operation of front and rear surfaces of the folder provided in the portable wireless terminal shown in Fig. 8.

5 Fig. 10 is a front view illustrating a state wherein the front and rear surfaces of the folder, provided in the portable wireless terminal shown in Fig. 8, are reversed with each other;

10 Fig. 11 is an exploded perspective view illustrating a rotary type hinge device for a portable wireless terminal in accordance with another preferred embodiment of the present invention;

15 Fig. 12 is a perspective view illustrating a coupling relation between a first hinge housing and a main shaft of the rotary type hinge device shown in Fig. 11;

20 Fig. 13 is a perspective view illustrating another coupling relation between the first hinge housing and the main shaft of the rotary type hinge device shown in Fig. 11;

Fig. 14 is a perspective view illustrating a state wherein the first hinge housing and main shaft of the rotary type hinge device shown in Fig. 11 are coupled to each other;

25 Fig. 15 is a perspective view illustrating a shaft cam and stopper cam of the rotary type hinge device shown in Fig. 11;

30 Fig. 16 is a perspective view illustrating another type of shaft cam and stopper cam of the rotary type hinge device shown in Fig. 11;

Fig. 17 is a perspective view illustrating still another type of shaft cam and stopper cam of the rotary type hinge device shown in Fig. 11;

35 Fig. 18 is a perspective view illustrating still another type of shaft cam and stopper cam of the rotary type hinge device shown in Fig. 11; and

Fig. 19 is a view illustrating a state wherein the rotary type hinge device shown in Fig. 11 is coupled to a folder.

[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT]

5 **[OBJECT OF THE INVENTION]**

[RELATED FIELD AND PRIOR ART OF THE INVENTION]

10 The present invention relates to a hinge device for a portable wireless terminal, and more particularly to a rotary type hinge device of a biaxial rotation manner, which enables the reversal of front and rear surfaces of a folder, opened away from a terminal body of a portable wireless terminal while rotating relative to the terminal body.

15 Generally, portable wireless terminals are classified into bar type terminals, flip type terminals and folder type terminals, in accordance with an external form thereof.

20 The bar type terminals are configured so that a single body housing thereof is provided with data input and output means and receiver and transmitter modules. In the case of the bar type terminals, there is a disadvantage that a keypad as data input means is always exposed to the outside, thereby causing the keypad to malfunction. In addition, the bar type terminals are limited in their miniaturization due to a required minimal distance between the receiver and transmitter modules.

25 The flip type terminals generally comprise a terminal body, a flip cover, and a hinge device adapted to rotatably couple the flip cover to the terminal body. The terminal body is mounted with data input and output means and receiver and transmitter modules. The flip cover serves to cover a keypad as data input means, thereby preventing the malfunctioning of the keypad. However, the flip type terminals are still limited in their miniaturization due to a required minimal distance between receiver and transmitter modules thereof.

35 The folder type terminals generally comprise a terminal body, a folder, and a hinge device adapted to rotatably couple the folder to the terminal body. The folder is adapted to be opened away from or closed to the terminal

body according to its rotation relative to the terminal body. In a folded state wherein the folder is in contact with the terminal body, the portable wireless terminal is in a call waiting mode while preventing the malfunction of a keypad as data input means mounted on the terminal body. Further, in an unfolded state
5 wherein the folder is rotated to an open position, the portable wireless terminal is in a conversation mode while ensuring a sufficient distance between transmitter and receiver modules, thereby advantageously miniaturizing the terminal. For this reasons, popularity of such folder type terminals is on the rise.

10 Those skilled in the art will easily appreciate such bar type, flip type or folder type terminals classified as stated above.

Now, considering the hinge device provided in the flip type or folder type terminals and adapted to rotatably couple the flip cover or folder to the terminal
15 body, the hinge device is configured to cause the flip cover or folder to be forced toward its open position without requiring any additional external force when the flip cover or folder is opened away from the terminal body exceeding a predetermined angle. Below the predetermined angle, the flip cover or folder is forced to come into close contact with the terminal body.

20 The conventional hinge device for use in the flip type or folder type portable wireless terminals is disclosed in U.S. Pat. No. 6,292,980, allowed to the applicant of the present invention, and so on. The hinge device, disclosed in said patent, comprises a hinge cam and hinge shaft, which are formed with
25 mountain-shaped portions or valley-shaped portions, respectively, and a hinge spring received in a hinge housing and adapted to urge the hinge cam to come into close contact with the hinge shaft. Namely, the hinge device is designed to open and close a flip cover or folder of a portable wireless terminal by means of circumferential curved surfaces of the mountain-shaped and valley-shaped
30 portions and by means of elastic force of the hinge spring.

Although functions of the portable wireless terminals have rapidly diversified as mobile services have become increasingly diversified, the conventional hinge device only has a function for simply causing the flip cover
35 or folder of the portable wireless terminal to be opened away from or closed to the terminal body. This causes many limitations to specifications of the portable wireless terminals. For example, there are limitations to the addition of certain

devices such as a camera lens to the terminals for utilizing various mobile services. Especially, in the case of the camera lens, it is difficult to harmonize an image capturing direction of the camera lens with an image display direction of a display device provided in the portable wireless terminal. In addition to the limitations of specification and design of the terminals, the conventional hinge device also has a disadvantage that it can't satisfy diverse customers' tastes and increasingly becoming diversified mobile services.

[SUBSTANTIAL MATTER OF THE INVENTION]

Therefore, the present invention has been made in view of the above problem, and it is an object of the present invention to provide a hinge device for a portable wireless terminal, which is advantageous in enabling changes to specification and design of the portable wireless terminal.

It is another object of the present invention to provide a hinge device for a portable wireless terminal, which can satisfy diverse customers' tastes.

It is yet another object of the present invention to provide a hinge device for a portable wireless terminal, which enables the reversal of front and rear surfaces of a folder provided in the portable wireless terminal.

In accordance with one aspect of the present invention, the above and other objects can be accomplished by the provision of a rotary type hinge device for a portable wireless terminal, which is installed between a terminal body and a folder of the portable wireless terminal, the hinge device having a first rotation axis for opening and closing operations of the terminal body and folder and a second rotation axis extending perpendicular to the first rotation axis and adapted to rotate relative to the first rotation axis, the hinge device being adapted to rotate the folder about the second rotation axis in a state wherein the folder and terminal body are opened, the hinge device comprising: a first hinge housing coupled to the terminal body to rotate about the first rotation axis, the first hinge housing being formed with a certain-shaped fixing portion at its inner peripheral surface, and an opening adapted to expose the fixing portion in a direction of the second rotation axis; a main shaft provided at its one end with a fixing end having a shape corresponding to that of the fixing portion, the main shaft extending in the direction of the second rotation axis and being adapted to be

protruded outwardly through the opening of the first hinge housing at the other end thereof; and a second hinge housing rotatably coupled to the other end of the main shaft protruded outwardly from the first hinge housing and adapted to rotate about the second rotation axis, the second hinge housing being fixed to the folder.

In accordance with another aspect of the present invention, there is provided a rotary type hinge device for a portable wireless terminal comprising: a first hinge housing, which is rotatable about a first rotation axis longitudinally extending through both ends thereof, the first hinge housing being formed at its inner peripheral surface with a certain-shaped fixing surface, and at its outer peripheral surface with an opening adapted to expose the fixing surface perpendicular to the first rotation axis; a main shaft provided at its one end with a fixing end having a shape corresponding to that of the fixing surface, the main shaft extending from the fixing end in a direction perpendicular to the first rotation axis, and being adapted to be protruded outwardly through the opening of the first hinge housing at the other end thereof, thereby providing a second rotation axis; and a second hinge housing rotatably coupled to the other end of the main shaft and adapted to rotate about the second rotation axis.

In accordance with yet another aspect of the present invention, there is provided a rotary type hinge device for a portable wireless terminal, which is installed between a terminal body and a folder of the portable wireless terminal, the hinge device having a first rotation axis for opening and closing operations of the terminal body and folder and a second rotation axis extending perpendicular to the first rotation axis and adapted to rotate relative to the first rotation axis, the hinge device being adapted to rotate the folder about the second rotation axis in a state wherein the folder and terminal body are opened, the hinge device comprising: a first hinge housing coupled to the terminal body to rotate about the first rotation axis, the first hinge housing being formed with a fixing groove surrounded by ribs extended to a certain height at its inner peripheral surface, and an opening adapted to expose the fixing groove in a direction of the second rotation axis; a main shaft provided at its one end with a fixing end having a shape corresponding to that of the fixing groove, the main shaft extending in the direction of the second rotation axis and adapted to be protruded outwardly through the opening of the first hinge housing at the other end thereof; and a second hinge housing rotatably coupled to the other end of the main shaft

protruded outwardly from the first hinge housing and adapted to rotate about the second rotation axis, the second hinge housing being fixed to the folder.

[CONSTRUCTION AND OPERATION OF THE INVENTION]

Now, preferred embodiments of the present invention will be described in detail with reference to the annexed drawings. In the drawings, the same or similar elements are denoted by the same reference numerals even though they are depicted in different drawings. In the following description, a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present invention rather unclear. Also, the terms used in the following description are terms defined taking into consideration the functions obtained in accordance with the present invention. The definitions of these terms should be determined based on the whole content of this specification because it may be changed in accordance with the option of a user or a usual practice.

Fig. 1 is an exploded perspective view illustrating a rotary type hinge device of a portable wireless terminal in accordance with a preferred embodiment of the present invention. As shown in Fig. 1, the rotary type hinge device according to the present invention, designated as a reference numeral 100, comprises a first hinge housing 101, a main shaft 102, and a second hinge housing 103. The rotary type hinge device 100 is adapted to be installed between a terminal body and a folder of a portable wireless terminal. The rotary type hinge device 100 provides a first rotation axis A1 for opening and closing operations of the folder and terminal body, and a second rotation axis A2 extending perpendicular to the first rotation axis A1.

The first hinge housing 101 is inserted into the terminal body of the portable wireless terminal and adapted to rotate about the first rotation axis A1. The first rotation axis A1 is an opening and closing axis of the folder and terminal body of the portable wireless terminal. The first hinge housing 101 is formed at its one surface with an opening 113 for enabling intercommunication between the interior and exterior of the first hinge housing 101. The first hinge housing 101 is also formed with a recessed fixing surface 111, having a certain shape, at the inner surface of the first hinge housing 101. The recessed fixing surface 111 is adapted to be exposed through the opening 113. The fixing

surface 111 serves to fix the main shaft 102, thereby preventing the rotation of the main shaft 102. For this, the fixing surface 111 is preferably formed into an angled shape.

5 The first hinge housing 101 is formed at its outer peripheral surface with a guide groove 117 along the edge of the opening 113. When the folder, opened away from the terminal body, rotates about the second rotation axis A2 extending perpendicular to the first rotation axis A1, the guide groove 117 serves to constrain the angular rotation range of the folder.

10 The first hinge housing 101 receives an opening/closing hinge module 109 therein at its one side. The opening/closing hinge module 109 is adapted to provide a rotating force to cause the folder to be unfolded, namely, opened if the folder is opened away from the terminal body exceeding a predetermined angle,
15 and also adapted to provide a rotating force to cause the folder to be folded, namely, closed if the folder is opened away from the terminal body below the predetermined angle. The opening/closing hinge module 109 is applied to the hinge device 100 in the same manner as U.S. Pat. No. 6,292,980, filed on September 25, 2001 and allowed to the applicant of the present invention. The
20 first hinge housing 101 is formed with a dummy hole 115 at an opposite side of the hinge module 109. The dummy hole 115 is adapted to be coupled with a certain-shaped hinge dummy (not shown), thereby allowing the first hinge housing 101 to be rotatably coupled with the terminal body of the portable wireless terminal.

25 Referring to Fig. 2, the main shaft 102a is provided at its one end with a fixing end 121a having a shape corresponding to the fixing surface 111, and at the other end with a fastening groove 127a and shaft cam 123a. The fastening groove 127a is adapted to be fastened with an E-ring 181. The shaft cam 123a
30 is formed at its outer peripheral surface with at least one pair of stopper recesses 125a arranged on opposite sides of the shaft cam, respectively. As shown in Fig. 2, the stopper recesses 125a extend perpendicular to the second rotation axis A2. Further, as shown in Fig. 3, the shaft cam 123b may be formed at its outer peripheral surface with stopper recesses 125b extending horizontally to the
35 second rotation axis A2. Furthermore, as shown in Fig. 4, the shaft cam 123c may be formed at its outer peripheral surface with at least one pair of flat stopper surfaces 125c. The main shaft 102b shown in Fig. 3 or main shaft 102c shown

in Fig. 4 may be formed with fixing end 121b or 121c and fastening groove 127b or 127c, respectively, which are the same as those of the main shaft 102a shown in Fig. 1.

5 As shown in Fig. 1, the main shaft 102a, 102b or 102c is adapted to be fastened using a screw 199, but it may be fixed to the first hinge housing 101 using various methods such as adhesion and so on.

10 The second hinge housing 103 is rotatably coupled to the end of the main shaft 102a, 102b or 102c, and adapted to rotate about the second rotation axis A2. As the second hinge housing 103 rotates about the second rotation axis A2, the folder, opened away from the terminal body, enables the reversal of front and rear surfaces thereof. The second hinge housing 103 has a receiving space defining unit 131. The receiving space defining unit 131 is formed at its upper and lower end surfaces with coupling holes 133, respectively, through which the
15 end of the main shaft 102a, 102b or 102c is penetrated. The coupling holes 133 are positioned on the second rotation axis A2. The fastening groove 127a formed at the end of the main shaft 102a is protruded outwardly from the upper end surface of the second hinge housing 103 after passing through the coupling
20 holes 133, and then the E-ring 181 is fastened to the protruded fastening groove 127a. The E-ring 181 and the upper end of the second hinge housing 103 interpose a washer 183 therebetween. The washer 183 is coupled to the end of the main shaft 102a, and adapted to prevent the wearing of the E-ring 181 and second hinge housing 103 during the rotation of the second hinge housing
25 103. When the second hinge housing 103 is coupled to the end of the main shaft 102a, the shaft cam 123a is positioned in the receiving space defining unit 131 of the second hinge housing 103.

30 The second hinge housing 103 has fastening arms 137 extended outwardly in opposite directions from the both sides thereof. The fastening arms 137 are formed with fastening holes 139 at their opposite ends, thereby providing means for coupling the second hinge housing 103 to the folder.

35 The receiving space defining unit 131 of the second hinge housing 103 receives stopper cams 141a at both sides of the shaft cam 123a positioned therein. Each stopper cam 141a is formed at its one end with a stopper projection 143a, which corresponds to the stopper recesses 125a formed at the

outer peripheral surface of the shaft cam 123a. As shown in Figs. 2 to 4, the shape of the stopper cam 141a, 141b or 141c is variable according to the shape of the shaft cam 123a, 123b or 123c.

5 The stopper cams 141a are adapted to receive an elastic force of coil springs 149, thereby coming into close contact with the shaft cam 123a. As the second hinge housing 103 rotates, the outer peripheral surface of the shaft cam 123a comes into slidable contact with the stopper projection 143a, thereby causing the stopper recess 125a and stopper projection 143a to be engaged due to
10 the elastic force of the coil spring 149. At this engagement position therebetween, the rotation of the second hinge housing 103 is stopped.

Referring to Fig. 6, the second hinge housing 103 is provided at its lower end surface with a slidable protuberance 132, which is adapted to slidably move
15 within the guide groove 117 of the first hinge housing 101. The guide groove 117 serves to restrict the rotation range of the slidable protuberance 132, thereby preventing the folder from rotating excessively in only one direction. If the folder rotates excessively in only one direction, a flexible printed circuit extending through the second hinge housing 103 may be damaged.

20 As shown in Figs. 2 and 3, the stopper recesses 125a or 125b may extend vertically or horizontally to the second rotation axis A2. In addition, as shown in Fig. 4, the shaft cam 123c may be formed at its outer peripheral surface with the flat stopper surfaces 125c, instead of the recesses, to effectively perform the
25 role of a stopper. In this case, it should be clearly understood that the stopper cam 141c must have the stopper projection 143a or 143b, or flat stopper surfaces 143c having a shape corresponding to the stopper recesses 125a or 125b, or flat stopper surfaces 125c.

30 Referring again to Fig. 1, the stopper cam 141a is adapted to come into slidable contact with the shaft cam 123a, thereby linearly reciprocating within the receiving space defining unit 131. In order to guide the linear reciprocating movements of the stopper cams 141a while preventing the stopper cams 141a from being released from the receiving space defining unit 131, each stopper
35 cam 141a is formed with a guide protrusion 145a at its outer peripheral surface. In addition, the upper or lower end surface of the receiving space defining unit 131 is formed with sliding guides 135 corresponding to the guide

protrusions 145a of the stopper cams 141a. Each sliding guide 135 may be a depressed portion at the inner wall of the receiving space portion 131, or, as shown in Fig. 1, may be a hole penetrating between the interior and exterior of the second hinge housing 103.

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Fig. 5 is a partial cut-away perspective view illustrating a state wherein the rotary type hinge device shown in Fig. 1 is coupled to a folder of the portable wireless terminal. Referring to Fig. 5, the second hinge housing 103 is fixed inside the one end of a folder of a portable wireless terminal, designated as a reference numeral 20. Although not shown, the second hinge housing 103 is fixed inside the folder 20 by fastening screws through the fastening holes 139 of the second hinge housing 103. As the second hinge housing 103 is fixed inside the one end of the folder 20, the first hinge housing 101 is positioned at the one end surface of the folder 20.

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Fig. 6 is a perspective view illustrating a state wherein a flexible printed circuit, designated as a reference numeral 191, is mounted through the rotary type hinge device 100. As shown in Fig. 6, the flexible printed circuit 191 extends longitudinally from the upper end of the main shaft 102, thereby entering into the first hinge housing 101. Preferably, the flexible printed circuit 191 is wound at least half way around the main shaft 102 within the first hinge housing 101. This prevents excessive force from being applied to the flexible printed circuit 191 in a state wherein the folder 20, opened away from the terminal body, is rotated about the second rotation axis A2.

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Figs. 7 to 10 illustrate a state wherein the rotary type hinge device 100 constructed as stated above is mounted in a portable wireless terminal, designated as a reference numeral 200. As shown in Figs. 7 to 10, the portable wireless terminal 200 comprises a terminal body 10, and the folder 20. The terminal body 10 is provided with a keypad 11 and a transmitter 13. The folder is provided with a display device 21 and a receiver 23. The terminal body 10 is also formed with respective side hinge arms 15 at both sides adjacent to the one end thereof.

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The first hinge housing 101 of the rotary type hinge device 100 is positioned at the one end of the folder 20 of the portable wireless terminal 200. As the first hinge housing 101 is rotatably coupled between the side hinge

arms 15, the folder 20 is adapted to rotate relative to the first rotation axis A1. Referring to Fig. 9, the folder 20, opened away from the terminal body 10, is rotated about the second rotation axis A2, thereby causing the reversal of the front and rear surfaces thereof. Then, as shown in Fig. 10, as the folder 20, having its front and rear surfaces reversed with each other, is closed to the terminal body 10, the display device 21 of the folder 20 is adapted to be exposed to the outside.

10 In the case of the terminal 200 constructed as stated above, one of the side hinge arms 15 is installed with a camera lens (not shown) to capture images in a direction of the first rotation axis A1. Alternatively, a camera lens rotatable relative to the first rotation axis A1 may be installed to one of the side hinge arms 15.

15 If the camera lens is mounted to capture images in the direction of the first rotation axis A1, as shown in Fig. 9, it can capture images or perform video communications in a state wherein the folder 20 is rotated at an angle of 90 relative to the second rotation axis A2.

20 If the camera lens is rotatably installed relative to the first rotation axis A1, as shown in Fig. 10, it is allowed to perform video communications by positioning the camera lens and the display device 21 to face the same direction in a state wherein the display device 21 is exposed. In addition, If the camera lens is positioned away from the display device 21, namely, positioned to face the rear surface of the portable wireless terminal 200, the image capturing using the portable wireless terminal 200 becomes easy.

30 Fig. 11 is an exploded perspective view illustrating a rotary type hinge device, designated as a reference numeral 300, of the portable wireless terminal, in accordance with another preferred embodiment of the present invention. As shown in Fig. 11, the rotary type hinge device 300 according to another preferred embodiment of the present invention comprises a first hinge housing 301, a main shaft 302 and a second hinge housing 303. The rotary type hinge device 300 is adapted to be installed between a terminal body and a folder of a portable wireless terminal. The rotary type hinge device 300 has a first rotation axis A1 for opening and closing operations of the folder and terminal body, and a second rotation axis A1 extending perpendicular to the first rotation axis A1, and being

adapted to rotate the folder, opened away from the terminal body, about the second rotation axis A2.

The first hinge housing 301 is inserted into the terminal body of the portable wireless terminal and adapted to rotate about the first rotation axis A1. The first rotation axis A1 is an opening and closing axis of the folder and terminal body of the portable wireless terminal. The first hinge housing 301 is formed at its one surface with an opening 313 for enabling intercommunication between the interior and exterior of the first hinge housing 301. The first hinge housing 301 is also formed with a fixing groove 311a (shown in Fig. 12), which is surrounded by ribs extended up to a certain height at the inner peripheral surface thereof exposed through the opening 313. The first hinge housing 313 further comprises a first guide rail 317a and a guide groove 317b, as shown in Fig. 12. The first guide rail 317a extends in a direction of the second rotation axis A2 from one side of the fixing groove 311a. The guide groove 317b is formed in the direction of the second rotation axis A2 at one surface of the first guide rail 317a facing the fixing groove 311a. The first guide rail 317a defines a slit 319 between its one side and the inner surface of the first hinge housing 301. The slit 319 is used for wiring a flexible printed circuit (not shown).

The fixing groove 311a and guide groove 317b are used to fix the main shaft 302. Each rib surrounding the fixing groove 311a is formed with a first fixing hole 311b (shown in Fig. 13) at a certain position. The first fixing hole 311b extends in the direction of the first rotation axis A1.

The first hinge housing 301 receives an opening/closing hinge module 109 therein at its one side. The opening/closing hinge module 109 is adapted to provide a rotating force to cause the folder to be unfolded, namely, opened if the folder is opened away from the terminal body exceeding a predetermined angle, and also adapted to provide a rotating force to cause the folder to be folded, namely, closed if the folder is opened away from the terminal body below the predetermined angle. The opening/closing hinge module 109 is applied to the hinge device 300 in the same manner as U.S. Pat. No. 6,292,980, filed on September 25, 2001 and allowed to the applicant of the present invention. The first hinge housing 301 is formed with a dummy hole 315 at an opposite side of the hinge module 109. The dummy hole 315 is adapted to be coupled with a certain-shaped hinge dummy (not shown), thereby allowing the first hinge

housing 301 to be rotatably coupled with the terminal body of the portable wireless terminal.

5 The main shaft 302a, extended in the direction of the second rotation axis A2, is provided at its both ends with a fixing end 321a and a shaft cam 323a, respectively, and also formed with a second guide rail 329 longitudinally extending at its one side. The fixing end 321a has a shape corresponding to the fixing groove 311a, and is formed with a second fixing hole 321b confronting with the fixing hole 311b when the fixing end 321a is coupled with the fixing groove 311a. As shown in Fig. 13, after the fixing end 321a is coupled with the fixing groove 311a, a fixing pin 399 is inserted into the first and second fixing holes 311b and 321b. At this time, the second guide rail 329 is inserted into the guide groove 317b. That is to say, as the fixing groove 311a and the fixing end 321a are coupled with each other and the guide groove 317b and the second guide rail 329 are coupled with each other, the main shaft 302a is firmly fixed to the first hinge housing 301. The shaft cam 323a is protruded outwardly from the first hinge housing 301, and formed with at least one pair of flat stopper surfaces at opposite sides thereof. The shaft cam 323a is formed at its upper end with a certain-shaped protrusion, which is formed at its outer peripheral surface with a fastening groove 327a. The fastening groove 327a is adapted to be fastened with an E-ring 181.

25 The second hinge housing 303 is rotatably coupled to the end of the main shaft 302a, and adapted to rotate about the second rotation axis A2. As the second hinge housing 303 rotates about the second rotation axis A2, the folder is adapted to reverse its front and rear surfaces with each other in a state wherein it is previously opened away from the terminal body. The second hinge housing 303 has a certain receiving space defining unit 331. The receiving space defining unit 331 is formed at its lower and upper end surfaces with respective coupling holes 333, through which the other end of the main shaft 302a is adapted to be penetrated. The coupling holes 333 are positioned on the second rotation axis A2. The fastening groove 327a formed at the end of the main shaft 302a is protruded outwardly from the upper end surface of the second hinge housing 303 after passing through the coupling holes 333, and then the E-ring 381 is fastened to the protruded fastening groove 327a. The E-ring 381 and the upper end of the second hinge housing 303 interpose a washer 383 therebetween. The washer 383 is coupled to the end of the main shaft 302a, and

adapted to prevent the wearing of the E-ring 381 and second hinge housing 303 during the rotation of the second hinge housing 303. When the second hinge housing 303 is coupled to the end of the main shaft 302, the shaft cam 323a is positioned in the receiving space defining unit 331 of the second hinge housing 303.

The second hinge housing 303 has fastening arms 337 extended outwardly in opposite directions from the both sides thereof. The fastening arms 337 are formed with fastening holes 339 at their opposite ends, thereby providing means for coupling the second hinge housing 303 to the folder.

The receiving space defining unit 331 of the second hinge housing 303 receives a plate spring 349a, and a pair of stopper cams 341a adapted to receive an elastic force of the plate spring 349a. The plate spring 349a extends in a transverse direction of the receiving space defining unit 331. The plate spring 349a has elastic pieces formed by bending both ends thereof. The elastic pieces extend to face each other, thereby providing the elastic force to the stopper cams 341a.

The pair of stopper cams 341a are positioned to face each other and are formed with support recesses 343b at their outer sides, and stopper recesses 343a at their inner sides facing each other. The support recesses 343b are supported by the elastic pieces, respectively. Each stopper recess 343a has a shape corresponding to a corner formed by adjacent stopper surfaces of the shaft cam 323a. The shaft cam 323a and stopper cams 341a come into close contact with each other due to the elastic force of the elastic pieces. Therefore, the rotation of the second hinge housing 303 is stopped in a position that the corners and stopper recesses 343a are engaged with each other.

As shown in Figs. 15 to 18, the shaft cam and stopper cam may be formed into various constructions. The shaft cam 323a or 323b may have two pairs of stopper surfaces, as shown in Figs. 15 and 17, or may have a pair of stopper surfaces, as shown in Figs. 16 and 18.

In accordance with the shape of the shaft cam 323a or 323b, the stopper cam 341a or 341b is formed with stopper recesses or stopper surfaces. Where the shaft cam 323a or 323b has two pairs of stopper surfaces, the rotation of the

second hinge housing 303 is stopped at an interval of 90. Where the shaft cam 323a or 323b has a pair of stopper surfaces, the rotation of the second hinge housing 303 is stopped at an interval of 180. In addition, where the shaft cam 323a or 323b has two pairs of stopper surfaces, it should be clearly understood
 5 that the rotation of the second hinge housing 303 is stopped at an interval of 90 even if the stopper cam 341a has a certain surface corresponding to the stopper surface of the shaft cam, instead of the stopper recess.

As shown in Fig. 17 or 18, the plate spring 349a may be substituted with
 10 coil springs 349b supporting the both ends of the stopper cam 341a or 341b. This will be appreciated from the previous embodiment.

Fig. 19 is a view illustrating a state wherein the rotary type hinge device 300 constructed as stated above is coupled to the folder 20. As shown in Fig. 19,
 15 the second hinge housing 303 is fixed to the folder 20 of the portable wireless terminal, and the first hinge housing 301 comes into close contact with the end of the folder 20. The second hinge housing 303 is firmly fixed to the folder 20 by fastening screws(not shown) through the fastening holes 339. In addition, the second hinge housing 303 may be integrally formed with the folder 20 using an
 20 injection molding method and so on. Although not shown, the first hinge housing 301 is rotatably coupled to the terminal body.

[EFFECT OF THE INVENTION]

As apparent from the above description, the present invention provides a
 25 rotary type hinge device for use in a portable wireless terminal, which enables the biaxial rotation of a folder, thereby enabling the reversal of front and rear surfaces of the folder. Therefore, in order to allow the portable wireless terminal to be appropriately utilized in motion picture providing services, video
 30 communications and so on according to mobile services becoming increasingly diversified, the rotary type hinge device thereof is adapted to easily harmonize an image display direction of a display device and an image capturing direction of a camera lens, thereby allowing the design or specification of the terminal to be easily changed. Further, according to the present invention, it is possible to
 35 prevent any excessive tension force from being applied to a flexible printed circuit, serving to provide the electrical connection between the folder and a

terminal body, even if the folder of the portable wireless terminal is rotated at various angles.

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[PATENT CLAIM(S)]

1. A rotary type hinge device for a portable wireless terminal, which is
5 installed between a terminal body and a folder of the portable wireless terminal,
the hinge device having a first rotation axis for opening and closing operations of
the terminal body and folder and a second rotation axis extending perpendicular
to the first rotation axis and adapted to rotate relative to the first rotation axis, the
hinge device being adapted to rotate the folder about the second rotation axis in a
10 state wherein the folder and terminal body are opened, the hinge device
comprising:

a first hinge housing coupled to the terminal body to rotate about the first
rotation axis, the first hinge housing being formed with a certain-shaped fixing
portion at its inner peripheral surface, and an opening adapted to expose the
15 fixing portion in a direction of the second rotation axis;

a main shaft provided at its one end with a fixing end having a shape
corresponding to that of the fixing portion, the main shaft extending in the
direction of the second rotation axis and being adapted to be protruded outwardly
through the opening of the first hinge housing at the other end thereof; and
20 a second hinge housing rotatably coupled to the other end of the main
shaft protruded outwardly from the first hinge housing and adapted to rotate
about the second rotation axis, the second hinge housing being fixed to the
folder.

25 2. The rotary type hinge device as set forth in claim 1, wherein the main
shaft is adapted to penetrate from a lower end surface of the second hinge
housing to an upper end surface thereof, thereby causing its one end to be
protruded from the upper end surface of the second hinge housing, the protruded
end of the main shaft being fastened with an E-ring.

30 3. The rotary type hinge device as set forth in claim 2, further comprising:
a shaft cam provided at the main shaft positioned within the second hinge
housing, the shaft cam being formed at its outer peripheral surface with at least
one pair of stopper recesses arranged on opposite sides of the shaft cam,
35 respectively; and

stopper cams formed at their respective one ends with stopper projections
having a shape corresponding to the stopper recesses, respectively, the stopper

cams being adapted to stop a rotation of the second hinge housing by receiving a certain elastic force within the second hinge housing at a position that the stopper recesses and stopper projections come into close contact with each other, respectively, the stopper cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing.

4. The rotary type hinge device as set forth in claim 3, wherein the respective stopper recesses of the shaft cam extend in a direction perpendicular to the second rotation axis.

5. The rotary type hinge device as set forth in claim 3, wherein the respective stopper recesses of the shaft cam extend in a direction parallel to the second rotation axis.

6. The rotary type hinge device as set forth in claim 3, wherein a pair of the stopper cams are arranged to face the shaft cam, respectively, at diametrically opposite sides of the shaft cam.

7. The rotary type hinge device as set forth in claim 3, wherein the second hinge housing is formed with a sliding guide extended longitudinally at its inner peripheral surface, and each stopper cam is formed at its outer peripheral surface with a guide protrusion corresponding to the sliding guide, whereby the sliding guide and guide protrusion being adapted to guide linear reciprocating movements of the stopper cam.

8. The rotary type hinge device as set forth in claim 2, further comprising: a shaft cam provided at the main shaft positioned within the second hinge housing, the shaft cam being formed at its outer peripheral surface with at least one pair of flat stopper surfaces arranged on opposite sides of the shaft cam, respectively; and

stopper cams formed at their respective one ends with stoppers, having a flat surface shape, being adapted to face the flat stopper surfaces, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving a certain elastic force within the second hinge housing at a position that the flat stopper surfaces and stoppers come into close contact with each other, respectively, the stopper cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing.

9. The rotary type hinge device as set forth in claim 8, wherein a pair of the stopper cams are arranged to face the shaft cam at diametrically opposite sides of the shaft cam.

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10. The rotary type hinge device as set forth in claim 8, wherein the second hinge housing is formed with a sliding guide extended longitudinally at its inner peripheral surface, and each stopper cam is formed at its outer peripheral surface with a guide protrusion corresponding to the sliding guide, whereby the sliding guide and guide protrusion being adapted to guide linear reciprocating movements of the stopper cam.

11. The rotary type hinge device as set forth in claim 2, wherein the second hinge housing further comprises fastening arms extended outwardly from both sides thereof, the fastening arms being formed with fastening holes at their opposite ends, respectively.

12. The rotary type hinge device as set forth in claim 1, wherein a flexible printed circuit protruded from an interior space of the folder extends longitudinally at one side of the main shaft, thereby entering into the first hinge housing through the opening thereof, and the flexible printed circuit is wound at least half way around the main shaft within the first hinge housing, and then drawn from one side end of the first hinge housing.

13. The rotary type hinge device as set forth in claim 1, wherein the second hinge housing is fixed within one end region of the folder.

14. The rotary type hinge device as set forth in claim 1, further comprising a folder opening/closing hinge module received within one side of the first hinge housing, the hinge module providing a rotating force to cause the folder to be opened if the folder is opened away from the terminal body exceeding a predetermined angle, and to cause the folder to be closed if the folder is opened away from the terminal body below the predetermined angle.

15. A rotary type hinge device for a portable wireless terminal comprising: a first hinge housing, which is rotatable about a first rotation axis longitudinally extending through both ends thereof, the first hinge housing being

formed at its inner peripheral surface with a certain-shaped fixing surface, and at its outer peripheral surface with an opening adapted to expose the fixing surface perpendicular to the first rotation axis;

5 a main shaft provided at its one end with a fixing end having a shape corresponding to that of the fixing surface, the main shaft extending from the fixing end in a direction perpendicular to the first rotation axis, and being adapted to be protruded outwardly through the opening of the first hinge housing at the other end thereof, thereby providing a second rotation axis; and

10 a second hinge housing rotatably coupled to the other end of the main shaft and adapted to rotate about the second rotation axis.

16. The rotary type hinge device as set forth in claim 15, further comprising:

15 a perforated hole formed at a lower end surface of the second hinge housing;

a shaft cam provided at the other end of the main shaft and adapted to be inserted through the perforated hole, thereby being positioned within the second hinge housing, the shaft cam being formed at its outer peripheral surface with at least one pair of stopper recesses arranged on opposite sides of the shaft cam, respectively; and

20 stopper cams formed at their respective one ends with stopper projections having a shape corresponding to the stopper recesses, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving a certain elastic force within the second hinge housing at a position that the stopper recesses and stopper projections come into close contact with each other, respectively, the stopper cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing.

30 17. The rotary type hinge device as set forth in claim 16, wherein the respective stopper recesses of the shaft cam extend in a direction perpendicular to the second rotation axis.

35 18. The rotary type hinge device as set forth in claim 16, wherein the respective stopper recesses of the shaft cam extend in a direction parallel to the second rotation axis.

19. The rotary type hinge device as set forth in claim 16, wherein a pair of the stopper cams are arranged to face the shaft cam at diametrically opposite sides of the shaft cam.

5 20. The rotary type hinge device as set forth in claim 15, further comprising:

 a perforated hole formed at a lower end surface of the second hinge housing;

 a shaft cam provided at the other end of the main shaft and adapted to be
10 inserted through the perforated hole, thereby being positioned within the second hinge housing, the shaft cam being formed at its outer peripheral surface with at least one pair of flat stopper surfaces arranged on opposite sides of the shaft cam, respectively; and

 stopper cams formed at their respective one ends with stoppers having a
15 flat surface shape, being adapted to face the flat stopper surfaces, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving a certain elastic force within the second hinge housing at a position that the flat stopper surfaces and stoppers come into close contact with each other, the stopper cams linearly reciprocating within the second hinge housing in
20 accordance with the rotation of the second hinge housing.

21. A rotary type hinge device for a portable wireless terminal, which is installed between a terminal body and a folder of the portable wireless terminal, the hinge device having a first rotation axis for opening and closing operations of
25 the terminal body and folder and a second rotation axis extending perpendicular to the first rotation axis and adapted to rotate relative to the first rotation axis, the hinge device being adapted to rotate the folder about the second rotation axis in a state wherein the folder and terminal body are opened, the hinge device comprising:

30 a first hinge housing coupled to the terminal body to rotate about the first rotation axis, the first hinge housing being formed with a fixing groove surrounded by ribs extended to a certain height at its inner peripheral surface, and an opening adapted to expose the fixing groove in a direction of the second rotation axis;

35 a main shaft provided at its one end with a fixing end having a shape corresponding to that of the fixing groove, the main shaft extending in the

direction of the second rotation axis and adapted to be protruded outwardly through the opening of the first hinge housing at the other end thereof; and

5 a second hinge housing rotatably coupled to the other end of the main shaft protruded outwardly from the first hinge housing and adapted to rotate about the second rotation axis, the second hinge housing being fixed to the folder.

10 22. The rotary type hinge device as set forth in claim 21, wherein the first hinge housing is further formed with a first guide rail extending in the direction of the second rotation axis at one side of the fixing groove, and a guide groove formed along the direction of the second rotation axis at one surface of the guide rail facing the fixing groove; and

15 wherein the main shaft is further formed at its one side with a second guide rail extended in the direction of the second rotation axis and adapted to be inserted into the guide groove.

20 23. The rotary type hinge device as set forth in claim 22, wherein the first guide rail defines a slit, having a certain width, between its one side and an inner side wall of the first hinge housing.

24. The rotary type hinge device as set forth in claim 21, wherein each rib surrounding the fixing groove is formed with a first fixing hole penetrating in a direction of the first rotation axis;

25 wherein the fixing end of the main shaft is formed with a second fixing hole penetrating in the direction of the first rotation axis, thereby confronting with the first fixing hole;

30 further comprising a fixing pin fastened through the first and second fixing holes in the direction of the first rotation axis after the fixing end is coupled to the fixing groove, thereby fixing the fixing end.

25. The rotary type hinge device as set forth in claim 21, wherein the main shaft penetrates the second hinge housing,

further comprising:

35 a shaft cam formed at its outer peripheral surface positioned within the second hinge housing with at least two pairs of stopper surfaces arranged on opposite sides of the shaft cam, respectively; and

stopper cams formed at their respective one ends with stopper recesses having a shape corresponding to corners formed by adjacent stopper surfaces, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving a certain elastic force within the second hinge housing at a position that the corners of the shaft cam and the stopper recesses come into close contact with each other, respectively, the stopper cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing.

26. The rotary type hinge device as set forth in claim 25, wherein the stopper cams are provided at both sides of the shaft cam, respectively,

further comprising a plate spring received within the second hinge housing, the plate spring being configured so that its both ends are bent and extended to face each other, thereby providing an elastic force to cause the stopper cams to come into close contact with the shaft cam.

27. The rotary type hinge device as set forth in claim 25, wherein the stopper cams are provided at both sides of the shaft cam, respectively,

further comprising coil springs received within the second hinge housing, the coil springs being adapted to provide an elastic force to the stopper cams, thereby causing the stopper cams to come into close contact with the shaft cam.

28. The rotary type hinge device as set forth in claim 21, wherein the main shaft penetrates the second hinge housing,

further comprising:

a shaft cam formed at an outer peripheral surface of the main shaft positioned within the second hinge housing with at least one pair of first stopper surfaces arranged on opposite sides of the shaft cam, respectively; and

stopper cams formed at their respective one ends with second stopper surfaces facing the first stopper surfaces, respectively, the stopper cams being adapted to stop a rotation of the second hinge housing by receiving a certain elastic force within the second hinge housing at a position that the first and second stopper surfaces come into close contact with each other, respectively, the stopper cams linearly reciprocating within the second hinge housing in accordance with the rotation of the second hinge housing.

29. The rotary type hinge device as set forth in claim 28, wherein the stopper cams are provided at both sides of the shaft cam, respectively,

5 further comprising a plate spring received within the second hinge housing, the plate spring being configured so that its both ends are bent and extended to face each other, thereby providing an elastic force to cause the stopper cams to come into close contact with the shaft cam.

30. The rotary type hinge device as set forth in claim 28, wherein the stopper cams are provided at both sides of the shaft cam, respectively,

10 further comprising coil springs received within the second hinge housing, the coil springs being adapted to provide an elastic force to the stopper cams, thereby causing the stopper cams to come into close contact with the shaft cam.

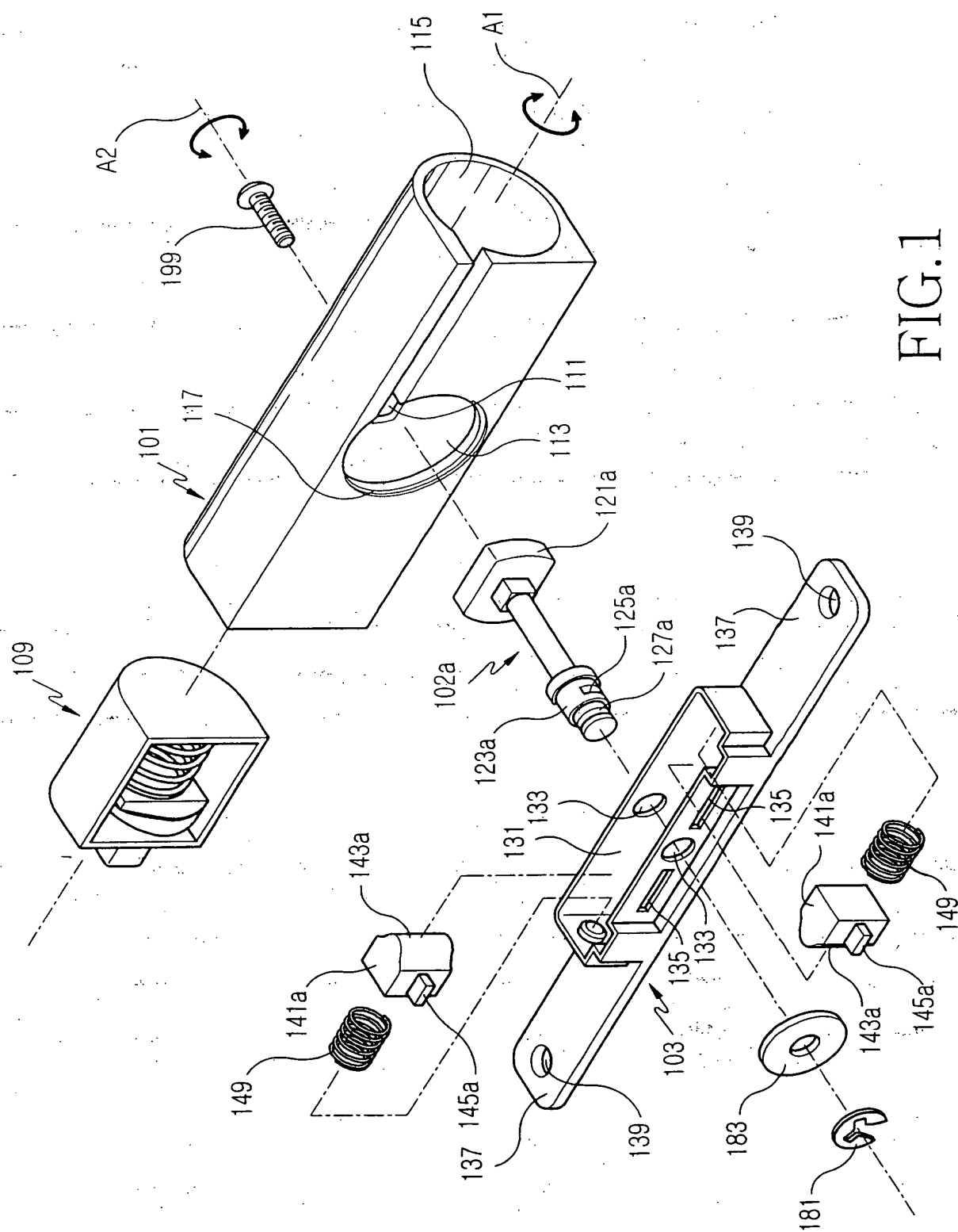


FIG. 1

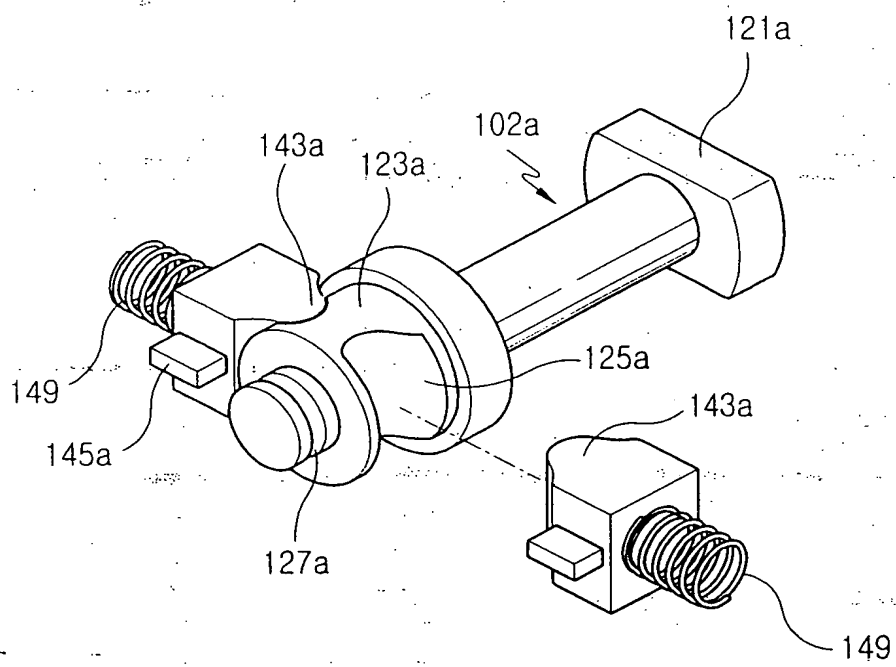


FIG. 2

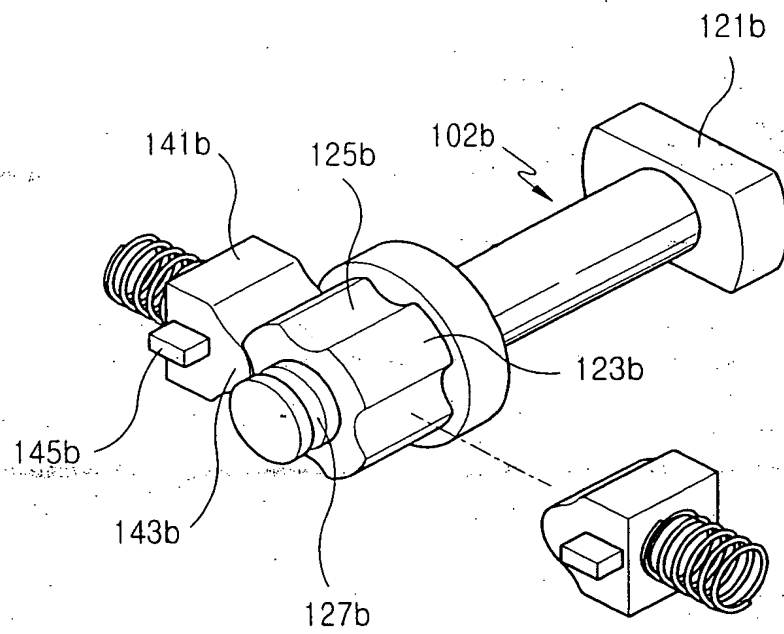


FIG.3

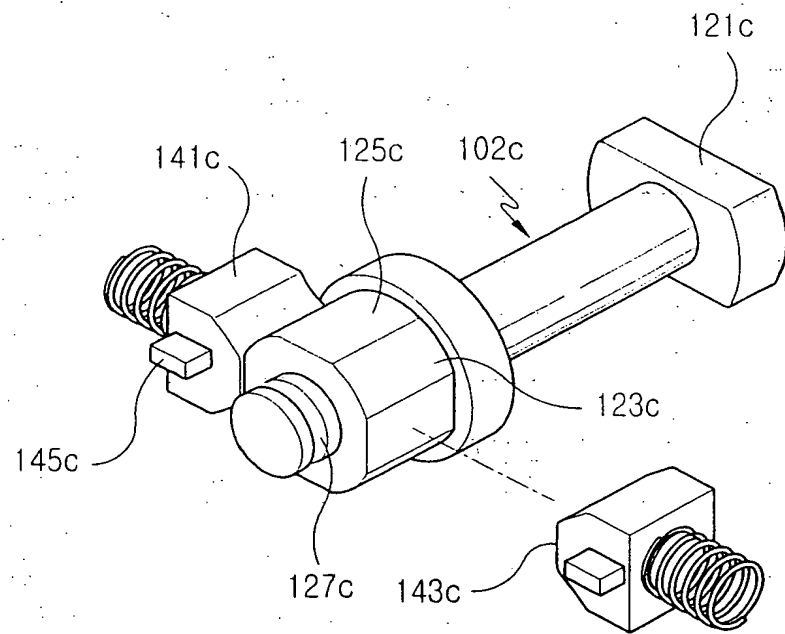


FIG.4

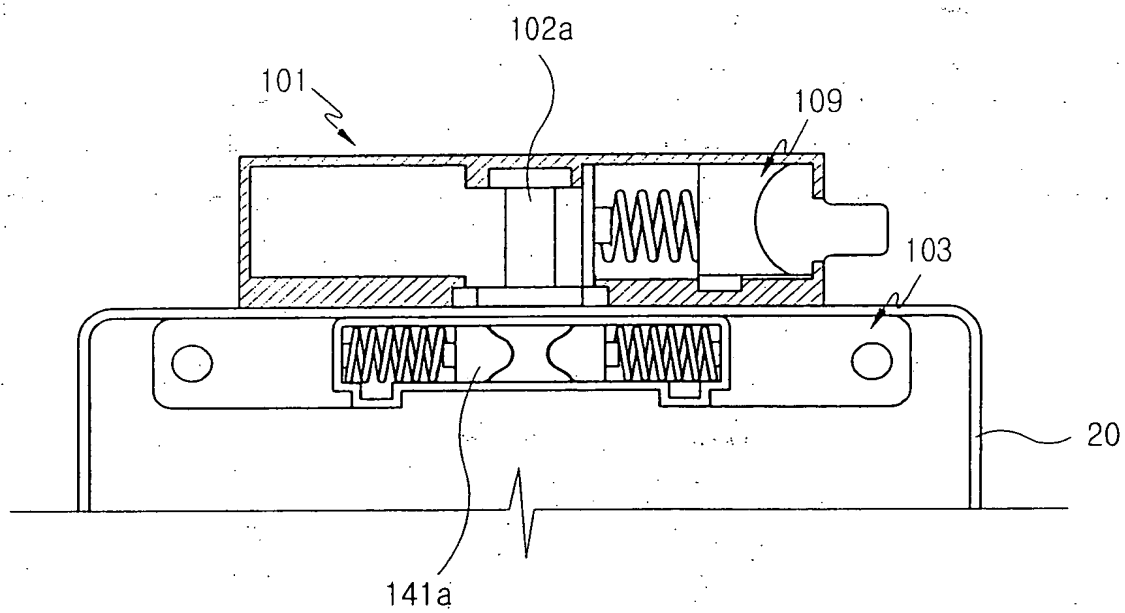


FIG.5

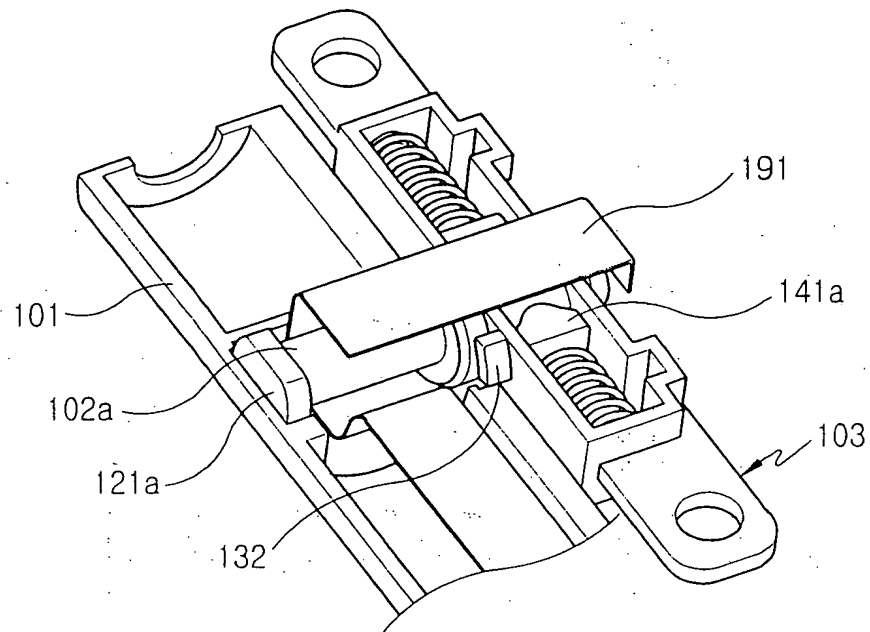


FIG. 6

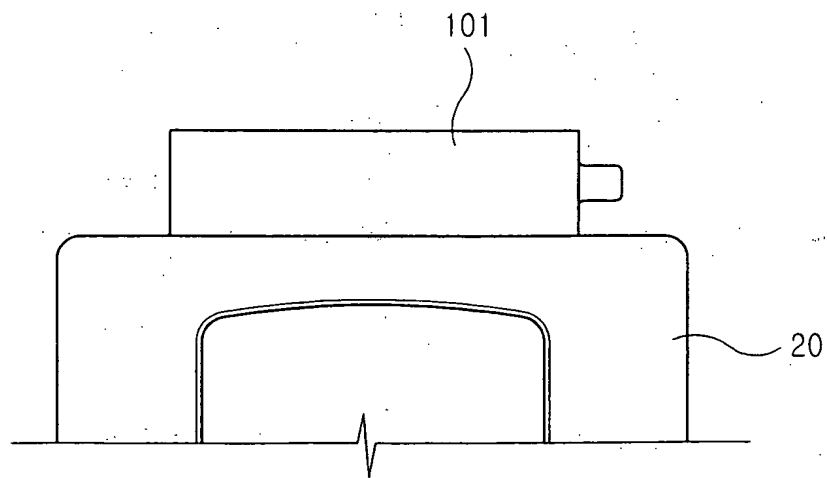


FIG. 7

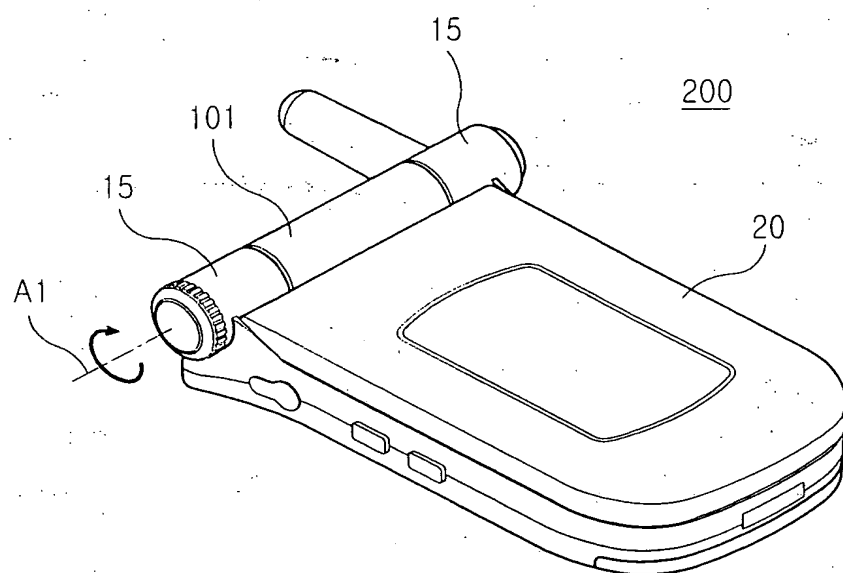


FIG. 8

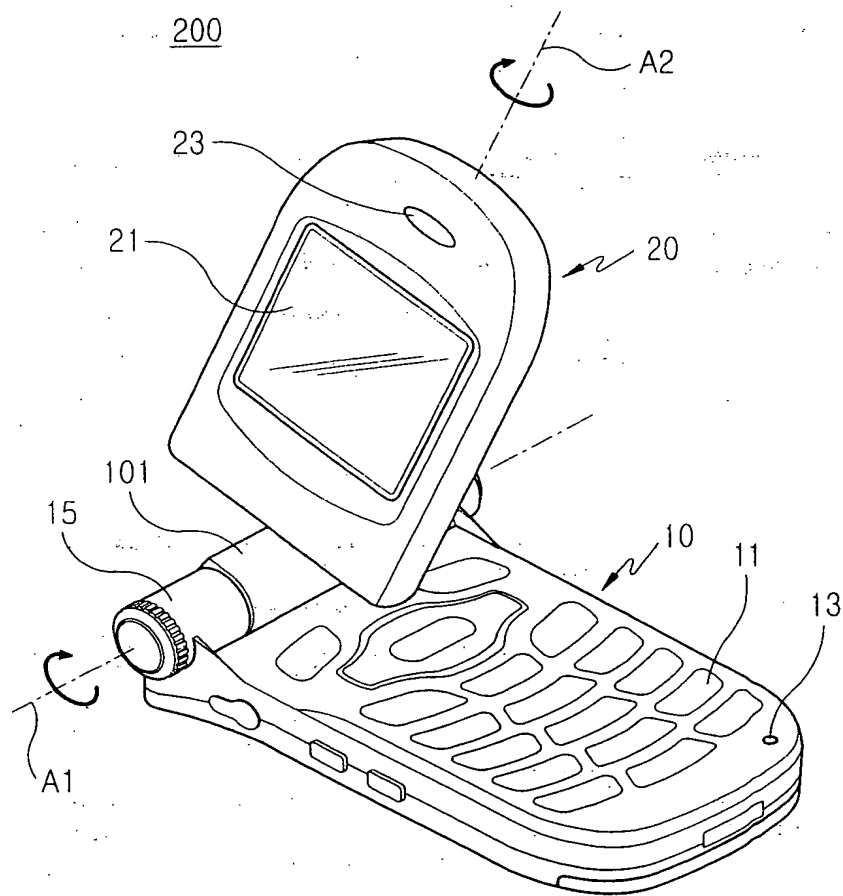


FIG. 9

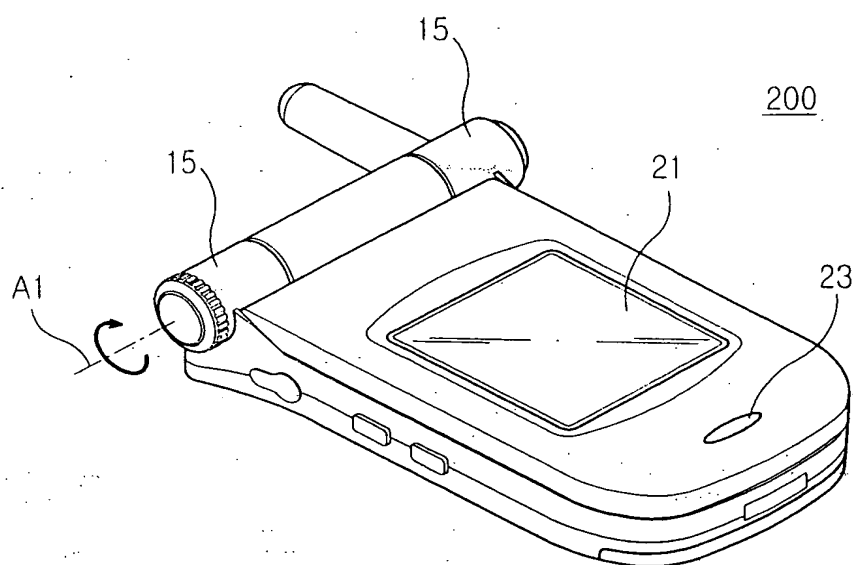


FIG.10

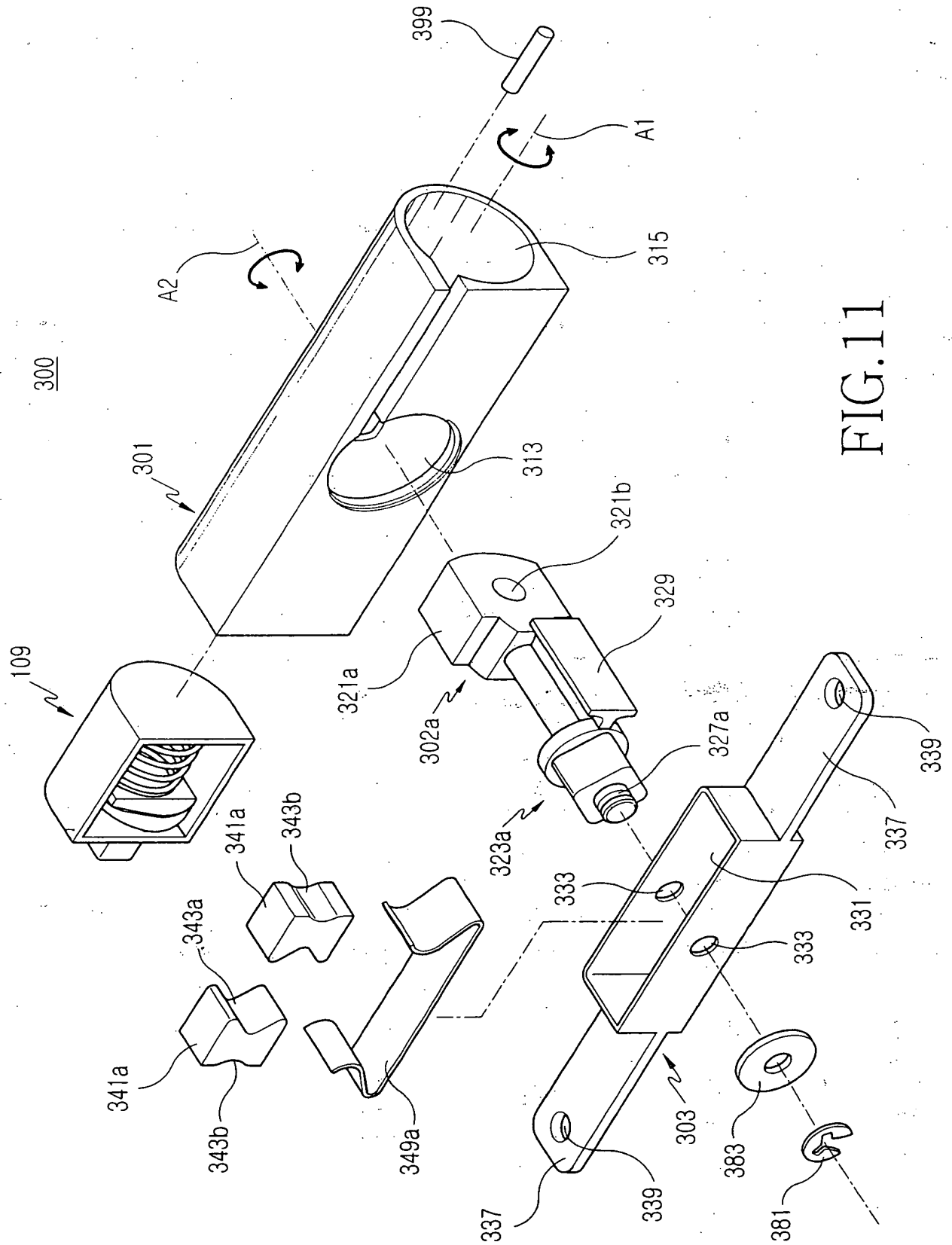


FIG. 11

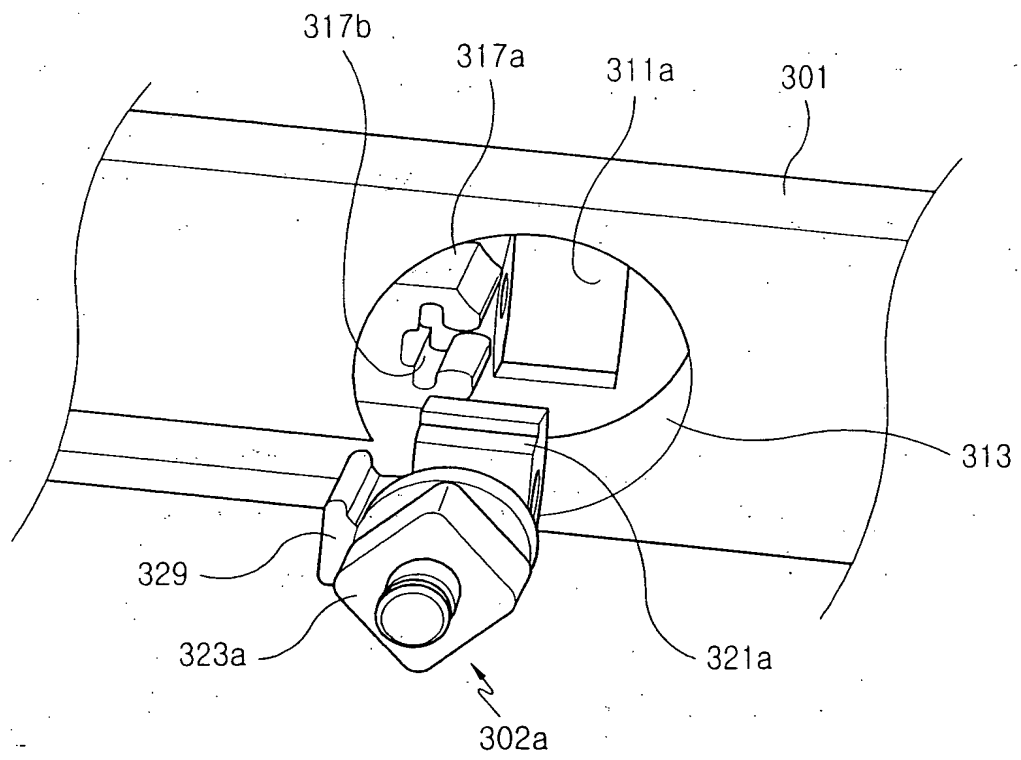


FIG.12

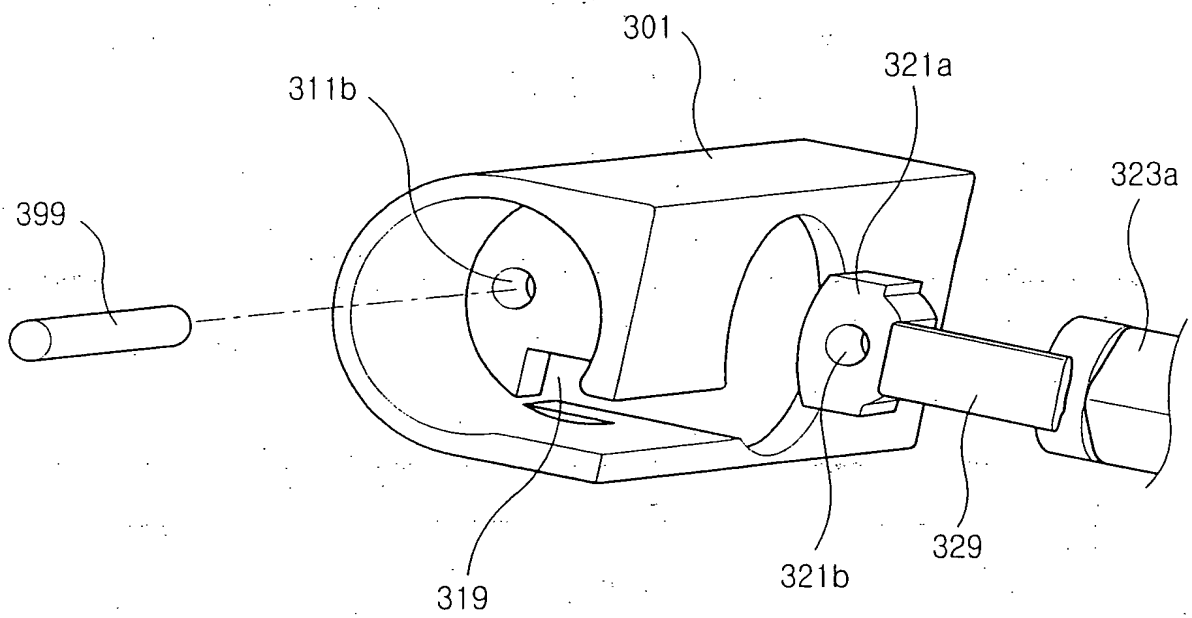


FIG.13

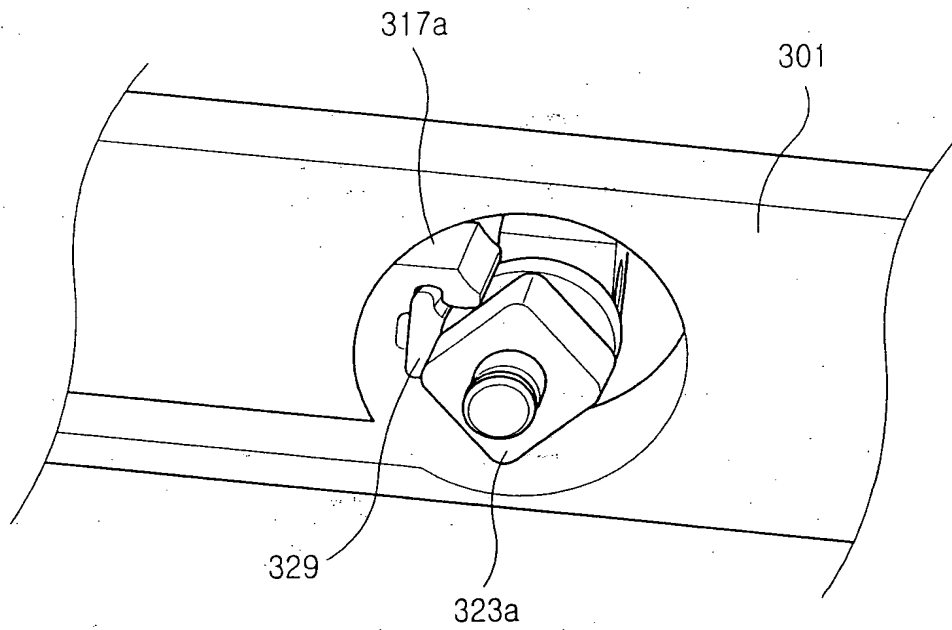


FIG.14

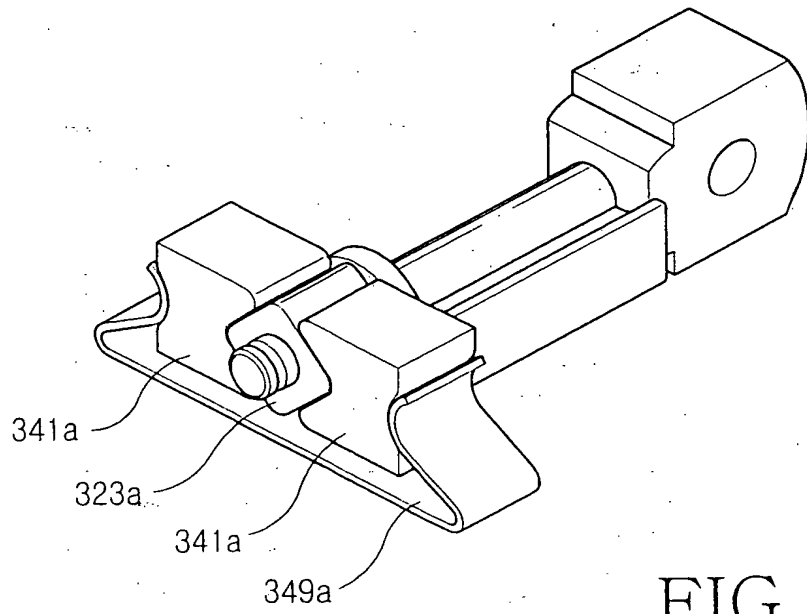


FIG. 15

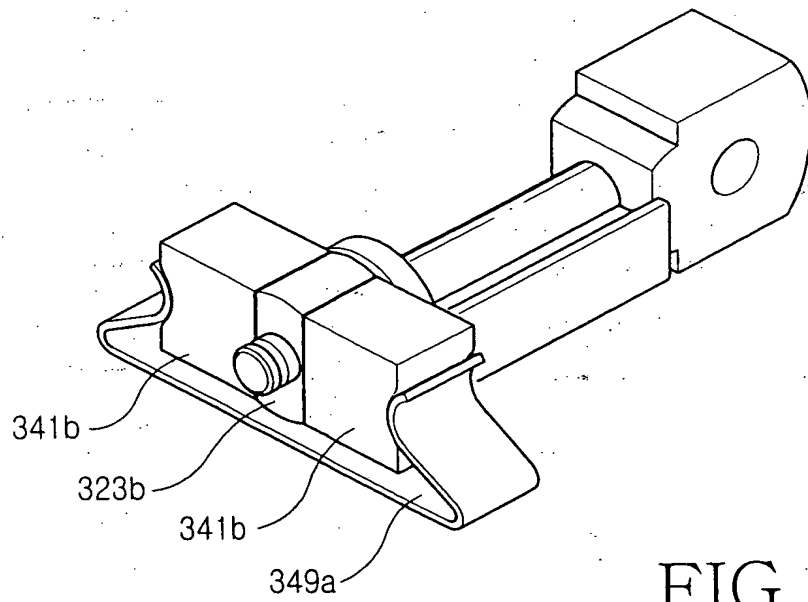


FIG. 16

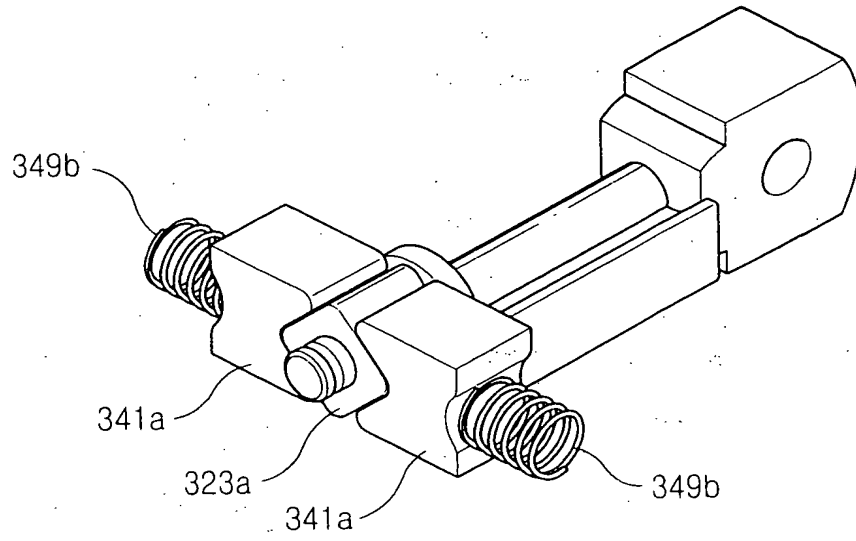


FIG.17

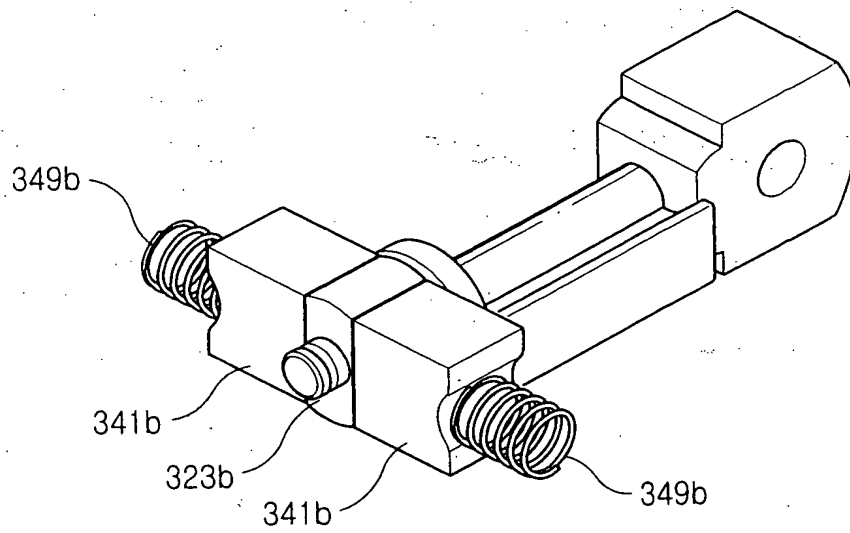


FIG.18

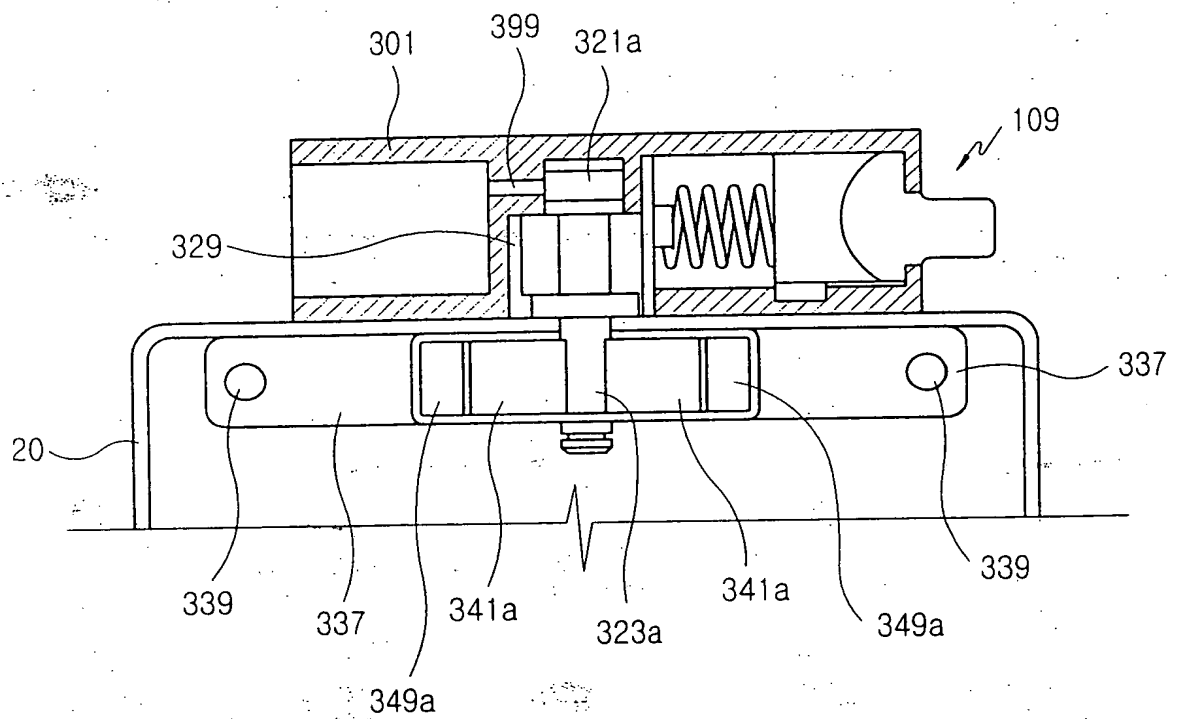


FIG.19

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